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# AIR FORCE OFFICE OF SCIENTIFIC RESEARCH

Air Force Systems Command

AFOSR

TECHNICAL REPORT SUMMARIES



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## INTRODUCTION

Subject Index and Personal Author Index

The Air Force Office of Scientific Research Technical Report Summaries are published quarterly as of March, June, September, and December of each calendar year. They consist of a brief summary of each AFOSR technical report received in the Technical Information Division and submitted to the Defense Technical Information Center (DTIC) for that quarter. The summaries contain two indexes for easily locating the technical reports that may be of interest to the user. These are followed by abstracts of the reports.

### 1) SUBJECT INDEX

- a. Subject Field
- b. Title of Report
- c. AD Number (Accession Number)

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- a. Primary Author
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## PURPOSE

✓ The purpose of this report is to inform Air Force Laboratories about the science that the Air Force Office of Scientific Research is supporting. (A) X



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AFOSR awards grants and contracts for research in areas of science relevant to the needs of the Air Force. Research is selected for support from proposals received in response to the Broad Agency Announcement originating from scientists investigating problems involving the search for new knowledge and the expansion of scientific principles. Selection is on the basis of scientific potential for improving Air Force operational capabilities, originality, significance to science, the qualification of the principal investigators, and the reasonableness of the proposed budget.

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The summaries consist of two indexes and the abstracts. From one of the two indexes, locate the AD number of the report that is of interest to you. Use this number to locate the abstract of the report in the abstracts section. The first report submitted to DTIC during the quarter (the one with the lowest AD number) appears on the last page of the abstracts section. The last report submitted to DTIC during the quarter (the one with the highest DTIC number) appears on the first page of the abstracts section. The following terms will give you a brief description of the elements used in each summary of this report.

DTIC Report Bibliography - DTIC's brief description of a technical report.

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Title - The title of the technical report.

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Contract/Grant Number - The instrument control number identifying the contracting activity and funding year under which the research is initiated.

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Supplementary Note - A variety of statements pertaining to a report. For example, if the report is a journal article, the supplementary note might give you the journal citation, which will include the name of the journal the article it appears in, and the volume number, date, and the page numbers of the journal.

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2,3:6,7-Bis(2',3'-quinolino)pentacyclo(6.5.0.0(4,12).0(5,10).0(9,13))tridecane,  
AD-A207859 REPORT DATE: 88 FINAL REPORT

27Al and 29Si NMR (Nuclear Magnetic Resonance) Study of Sol-Gel Derived Aluminosilicates and Sodium Aluminosilicates.  
AD-A208262 REPORT DATE: 88 FINAL REPORT

3 + 2) Resonance Enhanced Multiphoton Ionization of I and Br Formed from the Infrared Multiphoton Decomposition of CF3I and CF3Br.  
AD-A205537 REPORT DATE: 88 FINAL REPORT

TITLE INDEX 24

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AD-B130 800 CONTINUED

AEROJET ELECTROSYSTEMS CO AZUSA CA

(U) Investigation of the Feasibility of Engel-Breuer Compounds as High Temperature Oxidation-Resistant Coatings for Carbon-Carbon Composite Materials.

Zirconium. (JES)

DESCRIPTORS: (U) \*CARBON CARBON COMPOSITES, ARGON, AUGER ELECTRON SPECTROSCOPY, CARBON, COATINGS, CONTAMINATION, ELECTRONS, ION BOMBARDMENT, IRIIDIUM, OXIDATION, OXYGEN, PLATINUM, POLYCRYSTALLINE, PROCUREMENT, REGIONS, SURFACES, VOLTAGE.

DESCRIPTIVE NOTE: Annual rept. 10 Dec 87-31 Dec 88,

DEC 88

IDENTIFIERS: (U) WUAFOSR2306A2, PE61102F.

PERSONAL AUTHORS: Alvey, Mark D.; George, Patricia M.

CONTRACT NO. F49620-88-C-0005

PROJECT NO. 2306

TASK NO. A2

MONITOR: AFOSR  
TR-89-0236

UNCLASSIFIED REPORT

Distribution authorized to U.S. Gov't. agencies and their contractors; Specific Authority: 13 Mar 89. Other requests shall be referred to Air Force Office of Scientific Research, Bldg. 40, Bolling AFB, Washington, DC 20332-6448.

ABSTRACT: (U) Sample procurement and fabrication was the main thrust of the research effort in the past year. This was not an easy task as zirconium triplatinide, hafnium tri-iridinide and carbon-carbon composites coated with these materials were not commercially available. Representative samples of each material were fabricated. The cleaning, characterization and oxidation of polycrystalline zirconium triplatinide was performed with the following results. Argon ion bombardment at 2 kilo electron volts for 1 200 seconds removed carbon and oxygen contamination from vacuum chamber residual gases below observable levels, once the sample had been initially cleaned for approximately 18 000 seconds. Auger electron spectroscopy showed that the near surface region of the sample was stoichiometric in composition, and oxidation of zirconium triplatinide occurred above 1425 Kelvin. A method of coating carbon-carbon composites was initiated during the research period. Carbon carbon composites, Engel-Breuer hafnium, Iridium, Platinum,

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SEARCH CONTROL NO. EV132L

AD-A208 873 11/4  
ISRAEL INST OF METALS HAIFA

(U) Coating and Impregnation of Carbon-Carbon Composites with Ceramics by Electrophoretic Deposition.

DESCRIPTIVE NOTE: Final scientific rept. 1 Mar 88-28 Feb 89.

APR 89 84P  
PERSONAL AUTHORS: Gal-Or, L.; Liubovich, S.

CONTRACT NO. AFOSR-88-0097

PROJECT NO. 2306

TASK NO. A2

MONITOR: AFOSR  
TR 89-0685

UNCLASSIFIED REPORT

ABSTRACT: (U) Electrophoretic deposition of ceramic coatings on porous graphite and on a 2D C-C composite was studied using colloidal and fused SiO<sub>2</sub>, SiC and SiN. It was shown that all these ceramic materials acquire an electric charge and hence deposit under the electric field. In addition to the formation of a surface deposit, the induction of particles into the pores of porous graphite was demonstrated. The effects of deposition voltage, solvent properties and particle concentration on penetration were studied by examination of cross-sections in the SEM and by quantitative analysis of induced SiO<sub>2</sub>. Ceramic deposits of CeO<sub>2</sub>, ZrO<sub>2</sub> and Al<sub>2</sub>O<sub>3</sub> were formed on graphite and 2D C-C by an electrochemical reduction of aqueous solutions containing inorganic salts of the appropriate metals. (jes)

DESCRIPTORS: (U) \*CARBON CARBON COMPOSITES, ADDITION, CERAMIC COATINGS, CERAMIC MATERIALS, COATINGS, DEPOSITION, DEPOSITS, ELECTRIC CHARGE, ELECTRIC FIELDS, ELECTROCHEMISTRY, ELECTROPHORESIS, GRAPHITE, IMPREGNATION, INDUCTION SYSTEMS, INORGANIC COMPOUNDS, METALS, PARTICLES, POROUS MATERIALS, QUANTITATIVE ANALYSIS, REDUCTION, SALTS, SOLUTIONS(MIXTURES), SOLVENTS, SURFACES, VOLTAGE, WATER.

IDENTIFIERS: (U) PE61102F, WUAFOSR2306A2

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AD-A208 870 12/5 12/8

PURDUE UNIV LAFAYETTE IN

(U) The Mapping of Parallel Algorithms to Reconfigurable Parallel Architectures.

DESCRIPTIVE NOTE: Final rept..

MAY 86 7P

PERSONAL AUTHORS: Jamleson, Leah H.; Siegel, Howard J.; Delp, Edward J.; Whinston, Andrew

CONTRACT NO. F49620 86-K-0006

MONITOR: AFOSR  
TR-89-0731

UNCLASSIFIED REPORT

ABSTRACT: (U) One of the significant problems which must be addressed if we are to realize the computing potential offered by parallel architectures has to do with developing a better understanding of the relationship between parallel algorithms and parallel architectures. In this paper research on the mapping of algorithms to reconfigurable parallel architectures is presented. The thrust of this work is in identifying those characteristics of parallel algorithms which have the greatest effect on their execution, and in identifying a correspondence between those characteristics and the characteristics of parallel architectures. The context of this work is in the design of an Intelligent Operating System for the PASM reconfigurable multimicroprocessor system. The task of the Intelligent Operating System will be to direct the selection and scheduling of algorithms and the configuring of the architecture for the execution of an image understanding system. Reprints. (RH)

DESCRIPTORS: (U) \*ALGORITHMS, \*ARCHITECTURE, \*MICROPROCESSORS, \*PARALLEL PROCESSING, \*SCHEDULING, MAPPING, MULTIPLE OPERATION, PAPER, PARALLEL ORIENTATION, REPRINTS.

IDENTIFIERS: (U) PE61102F.

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AD-A208 866 CONTINUED

UNITED TECHNOLOGIES RESEARCH CENTER EAST HARTFORD CT

VINYL RADICALS.

(U) The Determination of Rate-Limiting Steps during Soot Formation.  
IDENTIFIERS: (U) Cyclopentadiene, Vinylacetylene, Diffusion flames.

DESCRIPTIVE NOTE: Annual rept. 1 Feb 88-31 Jan 89.

APR 89 82P

PERSONAL AUTHORS: Colket, M. B.; Hall, R. J.; Sangiovanni, J. J.; Seery, D. J.

REPORT NO. UTRC89-13

CONTRACT NO. F49620-88-C-0051

PROJECT NO. 2308

TASK NO. A2

MONITOR: AFOSR  
TR-89-0715

UNCLASSIFIED REPORT

ABSTRACT: (U) A single-pulse shock tube has been used to examine toluene pyrolysis and the rich oxidation of benzene diluted in argon over the temperature range of 1200 to 2000K and at total pressures of ten to thirteen atmospheres. Dwell times were about 500 microseconds. Collected gas samples were analyzed using gas chromatography for hydrogen, carbon oxides and C1- to C14-hydrocarbons. Low molecular weight products during benzene oxidation include cyclopentadiene and vinylacetylene and support literature proposals for oxidation of benzene. High molecular weight products are dominated by species containing mixtures of five- and six-membered rings. During toluene pyrolysis very rapid production of polyaromatic hydrocarbons occurs between 1400 and 1450K, consistent with temperatures at which particle inception occurs in diffusion flames. (aw)

DESCRIPTORS: (U) BENZENE, OXIDATION, PYROLYSIS, SOOT, TOLUENES, REACTION KINETICS, ARGON, CARBON, CYCLOPENTENES, DIFFUSION, DWELL TIME, FLAMES, GAS CHROMATOGRAPHY, GASES, HYDROCARBONS, HYDROGEN, LIGHTWEIGHT, MOLECULAR WEIGHT, OXIDES, PARTICLES, PENTADIENES, RINGS, SAMPLING, TEMPERATURE, ACETYLENE.

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AD-A208 864

6/3

OREGON STATE UNIV CORVALLIS

(U) Variability and Chaos: NeuroIntegrative Principles in Self-Organization of Motor Patterns.

DESCRIPTIVE NOTE: Rept. for 1 Oct 86-14 Jan 89.

MAR 89 31P

PERSONAL AUTHORS: Mpitsos, G. J.; Creech, H. C.; Cohan, C. S.; Mendelson, M.

CONTRACT NO. AFOSR-86-0076

PROJECT NO. 2312

TASK NO. A1

MONITOR: AFOSR  
TR-89-0705

UNCLASSIFIED REPORT

ABSTRACT: (U) We discuss the possibility that variability may be a central feature of self-organizing processes. We suggest that variability may be inherently part of the mechanisms by which adaptive neurocircuits emerge, and contrast such functional neurocircuits against definitions involving anatomical or dynamical structures which the self-organizational definition both contains and supercedes. The experimental work focuses on an invertebrate animal, the sea slug, *Pleurobranchaea californica*, which has a rich behavioral repertoire of buccal/oral behaviors, and a relatively simple nervous system containing identifiable neurons. We present evidence from work on a set of 20 neurons, which we refer to as BCNs (buccal-cerebral neurons), that communicate between the buccal ganglion and cerebral ganglion. These neurons are crucial for generating all buccal/oral behaviors, and provide an advantageous source of experimental material for inquiring into the self-organization of group activity. Variability in the activity of the BCNs, and in the motoneurons that they drive, is attributable to low-dimensional chaos. These findings indicate that some variability may arise from the same mechanisms that generate the patterned activity, i.e., that the observed variations are not noise that is superimposed on the code underlying a behavior. The role

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of sensory feedback in the production of adaptive behavior of animals as they interact with complex and often unpredictable environments is discussed and we suggest that chaotic neural activity provides a means for the nervous system to create new informational space rendering animals more stably adaptable in such changing environments. (AW)

DESCRIPTORS: (U) \*MOTOR NEURONS, \*NEURAL NETS, \*NERVE TRANSMISSION, ANATOMY, BEHAVIOR, CEREBRUM, DYNAMICS, FEEDBACK, GANGLIA, INVERTEBRATES, MATERIALS, NERVE CELLS, NERVOUS SYSTEM, PATTERNS, PRODUCTION, SELF ORGANIZING SYSTEMS, SENSES(PHYSIOLOGY), SOURCES, MOUTH, GASTROPODA.

IDENTIFIERS: (U) Self organization, \*Neurocircuits, Buccal oral behavior, Sea slugs, Pleurobranchaea California, Adaptive neurocircuits.

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WASHINGTON UNIV SEATTLE

(U) Multilayered Electronic Materials and Devices Based on III-V Compounds.

EQUIPMENT, ELECTRONICS LABORATORIES, EPITAXIAL GROWTH, GALLIUM COMPOUNDS, GROUP III COMPOUNDS, GROUP V COMPOUNDS, LAYERS, MATERIALS, STRUCTURES, SUBSTRATES, THICKNESS, WAFERS, WATER, INDIUM, PHOSPHIDES.

DESCRIPTIVE NOTE: Final rept. 1 Oct 86-30 Sep 88.

IDENTIFIERS: (U) PE81102F, WUAFOSR2917AG, \*Metal organic chemical vapor deposition, MOCVD (Metal Organic Chemical Vapor Deposition).

DEC 88 13P

PERSONAL AUTHORS: Olsen, Larry C.

CONTRACT NO. AFOSR-87-0034

PROJECT NO. 2917

TASK NO. A6

MONITOR: AFOSR  
TR-89-0732

UNCLASSIFIED REPORT

ABSTRACT: (U) The objectives of this program were to purchase and install a Metal Organic Chemical Vapor Deposition (MOCVD) system in the Electronic Materials Laboratory at the Tri-Cities University Center of the University of Washington. This system would be used to grow films of III-V compounds. This reactor will be used to grow layered structures based on Gallium Arsenide, AlGaInAs, InGa(1-y)As or GaAsxPi-x. Prior to shipping the MOCVD system, Spire personnel grew GaAs films on GaAs substrates with the TUC 500XT reactor. Excellent results were obtained. Films grown on two-inch wafers exhibited a thickness uniformity of better than 2% and a doping uniformity better than 4.5%. With three-inch wafers, films were characterized by a thickness uniformity of 4% and doping uniformity of 8%. They also found that the Aluminum Gallium Arsenide composition uniformity was better than 2% for AlGaAs films grown on two-inch wafers. Finally, the background doping in epitaxial GaAs films grown with the TUC reactor was determined to be less than 1.5x10 to the 14th power/CC. These performance figures represent a significant improvement in GaAs epitaxial film growth. (AW)

DESCRIPTORS: (U) \*SEMICONDUCTING FILMS, \*GALLIUM ARSENIDES, \*VAPOR DEPOSITION, ALUMINUM GALLIUM ARSENIDES, BACKGROUND, CHEMICAL COMPOSITION, DOPING, ELECTRONIC

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AD-A208 841 12/1 17/7.3

UNIVERSITY OF SOUTH FLORIDA TAMPA

UNIVERSITY OF WEST FLORIDA PENSACOLA DEPT OF SYSTEMS SCIENCE

(U) Investigations in Improved Iterative Methods for Solving Sparse Systems of Linear Equations.

(U) An Investigation of Estimation Techniques in Optimally Guided Air-to-Air Missiles.

DESCRIPTIVE NOTE: Final rept. 1 Jun 79-31 May 80.

DESCRIPTIVE NOTE: Final rept. Jun-Sep 81.

AUG 80 4P

NOV 81 14P

PERSONAL AUTHORS: Saff, E. B.

PERSONAL AUTHORS: Harbor, Royce D.

CONTRACT NO. F49620-79-C-0102

CONTRACT NO. AFOSR-81-0180

PROJECT NO. 2304

PROJECT NO. 2307

TASK NO. A3

TASK NO. D9

MONITOR: AFOSR TR-89-0681

MONITOR: AFOSR TR-89-0687

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) Research conducted by the principal investigator during the period June 1, 1979 to May 31, 1980, resulted in the following research articles which have either appeared in print, or have been accepted in refereed mathematical journals, in this period: Inequalities for polynomials with a prescribed zero; On the Enestromakeya Theorem and Its Sharpness; Bounds for incomplete polynomials vanishing at both endpoints of an interval; Remarks on some conjectures of G. G. Lorentz; On incomplete polynomials; An extension of the Enestromakeya Theorem and its sharpness; On zeros of generalized Bessel polynomials; Incomplete factorizations of matrices and connections with H-matrices; On two conjectures on the zeros of generalized Bessel polynomials; Incomplete polynomials: an electrostatic approach; An introduction to the Convergence Theory of Pade' Approximants. (kr)

DESCRIPTORS: (U) ITERATIONS, CONVERGENCE, ELECTROSTATICS, INEQUALITIES, MATRICES(MATHEMATICS), LINEAR ALGEBRAIC EQUATIONS, MATHEMATICS, PERIODICALS, POLYNOMIALS, THEORY.

IDENTIFIERS: (U) WJAFOSR2304A3.

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ABSTRACT: (U) In previous work the author sought to explain the fact that certain states estimated by an extended Kalman filter differed significantly from the same quantities generated by a truth model. Results indicated that the probable cause for this behavior was the state model of the system used in the extended Kalman filter. In the present work the study was extended to include the treatment of differences observed in system behavior when under the influence of extended Kalman filters based upon six-state and nine-state models. When the apparent anomalies in system performance are viewed in the light of filter modeling limitations, the performance of both the six-state and nine-state filters appear to be well within the bounds of expectation. A similar statement could be made for the relative performance between the two filters. Clearly, the six-state filter would not be satisfactory in a realistic environment. The nine-state filter, however, while performing quite well for the runs examined, might be made still better through improvements in its state model. Keywords: Mathematical filter estimations; Air to air missiles; Optimal guidance. (EDC)

DESCRIPTORS: (U) ESTIMATES, GUIDANCE, KALMAN FILTERING, AIR TO AIR MISSILES, ANOMALIES, GUIDED

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI32L

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MISSILES, LIMITATIONS, MATHEMATICAL FILTERS, MATHEMATICAL  
MODELS, OPTIMIZATION.

TEXAS A AND M UNIV COLLEGE STATION DEPT OF AEROSPACE  
ENGINEERING

IDENTIFIERS: (U) Extended Kalman filters, PEG1102F,  
WUAFOSR2307D9.

(U) Ultrasonic Nondestructive Evaluation of Damage in  
Continuous Fiber Composites.

DESCRIPTIVE NOTE: Final rept. 1984-1988.

89 92P

PERSONAL AUTHORS: Kinra, Vikram K.

CONTRACT NO. AFOSR-84-0066

PROJECT NO. 2308

TASK NO. B2

MONITOR: AFOSR  
TR 87-2033

UNCLASSIFIED REPORT

ABSTRACT: (U) A new technique for measuring the wavespeed and attenuation in the thickness direction, in extremely thin laminates, and the excitation and detection of Lamb waves in the lengthwise direction has been developed. Thus both in-plane and out-of-plane and out-of-plane measurements can be made. Damage in the form of transverse cracking in cross-ply graphite/epoxy laminates has been studied by the use of these two techniques. For through-the-thickness measurements the stiffness was found to be insensitive to transverse cracking. The attenuation, however, was found to be quite sensitive and, therefore, has been shown to be a reliable damage metric for the complementary case of Lamb wave propagation in the lengthwise direction, both the stiffness and the attenuation were observed to be sensitive damage parameters. Velocity, Composites, Ultrasonic, Attenuation, Damage, Nondestructive evaluation (jes)

DESCRIPTORS: (U) FIBER REINFORCED COMPOSITES, ATTENUATION, CRACKS, DAMAGE, EPOXY LAMINATES, GRAPHITE, LAMINATES, MEASUREMENT, NONDESTRUCTIVE TESTING, PARAMETERS, RELIABILITY, SENSITIVITY, STIFFNESS, THICKNESS, THINNESS, TRANSVERSE, ULTRASONIC TESTS.

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IDENTIFIERS: (U) PEG1102F, WUAFUSR2308B2.

UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES LOKER  
HYDROCARBON RESEARCH INST

(U). Synthesis and Photodegradation of Poly(2,5-  
bis(dimethylsilyl)thiophene).

89 9P

PERSONAL AUTHORS: Hu, Shui-Sheng; Weber, William P.

CONTRACT NO. AFOSR-89-0007

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-89 0713

UNCLASSIFIED REPORT

SUPPL. ENTRY NOTE: Pub. in Polymer Bulletin, v21 p133-  
140 1989.

ABSTRACT: (U) Poly(2,5-bis(dimethylsilyl)thiophene) (I),  
a copolymer with alternating thiophene and disilyl units,  
has been prepared by the Wurtz coupling of 2,5-  
bis(dimethylchlorosilyl)-thiophene (IV) with sodium metal  
in toluene. I has been characterized by IR, <sup>13</sup>C and <sup>29</sup>Si  
NMR, IR, UV, GPC, TGA and elemental analysis. The  
photolysis of I in benzene/methanol solution results in  
degradation of the polymer. The structure of the photo-  
products and possible mechanisms for their formation are  
discussed. Keywords: Copolymer; Thiophene;  
Photodegradation; Methyl radicals; Silyl radicals;  
Reprints. (MUM)

DESCRIPTORS: (U) \*POLYMERS, \*THIOPHENES, BENZENE,  
CARBINOLS, DEGRADATION, METALS, METHYL RADICALS,  
PHOTODEGRADATION, PHOTOLYSIS, REPRINTS, SODIUM,  
SOLUTIONS(GENERAL), SYNTHESIS, TOLUENES.

IDENTIFIERS: (U) PEG1102F, WUAFUSR2303B2.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI32L

AD-A208 792

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NORTHWESTERN UNIV EVANSTON IL

(U) Approaches to Polymeric Nonlinear Optical Materials.  
Theoretical and Synthetic Design Strategies.

89 11P

PERSONAL AUTHORS: Li, D.; Minami, N.; Ratner, M. A.; Ye,  
C.; Marks, T. J.

CONTRACT NO. AFOSR-88-0105, NSF-DMR85-20280

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-89-0654

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Synthetic Metals, v28 pD585-  
D593 1989.

ABSTRACT: (U) Two aspects of the rational construction of polymeric frequency doubling materials are described. First, a computationally efficient SCF LCAO MECI pi electron theoretical approach has been developed to aid in chromophore design and to better understand molecular electronic structure/architectural features which give rise to high quadratic molecular optical nonlinearities (beta). Selected high-beta chromophores are then covalently linked via several synthetic procedures to robust, glassy, film-forming chloromethylated or hydroxylated polystyrenes. By this procedure, it is possible to achieve very high chromophore densities in polymeric films with good optical transparency and chemical stability characteristics. Coating of these polymers onto conductive glass, followed by electric field poling near Tg yields robust films with high persistent SHG efficiencies. As an example, films of poly(p-hydroxystyrene) functionalized with N-(4-nitrophenyl)-L-prolinol exhibit d33 as high as 18 x 10 to the 9th esu at 1.06 micro (16 times the corresponding value for KDP). Polymers, Styrenes, Reprints. (mjn)

DESCRIPTORS: (U) POLYMERIC FILMS, CHEMICAL PROPERTIES,  
COATINGS, CONDUCTIVITY, CONSTRUCTION, ELECTRONICS.

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ELECTRONS, FILMS, FREQUENCY, GLASS, HYDROXYL RADICALS,  
METHODODOLOGY, MOLECULAR STRUCTURE, NONLINEAR SYSTEMS,  
OPTICAL MATERIALS, OPTICS, POLYMERS, POLYSTYRENE,  
REPRINTS, STABILITY, STRATEGY, STYRENES, THEORY,  
TRANSPARENCIES.

IDENTIFIERS: (U) PEG1102F, WJAFOSR2303A3.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EV132L

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AD-A208 791 CONTINUED

NORTHWESTERN UNIV EVANSTON IL

(U) Poled Polymeric Nonlinear Optical Materials. Enhanced Second Harmonic Generation Stability of Cross-Linkable Matrix/Chromophore Ensembles.

CHROMOPHORES, DYNAMICS, GLASS, HARMONIC GENERATORS, MATERIALS, NONLINEAR SYSTEMS, OPTICAL MATERIALS, OPTICAL PROPERTIES, PHYSICAL PROPERTIES, PHYSIOLOGICAL DISORIENTATION, QUADRATIC EQUATIONS, RELAXATION, REPRINTS, STABILITY, VOLUME.

89

4P

IDENTIFIERS: (U) PE61102F, WDAr0SR2303A3.

PERSONAL AUTHORS: Hubbard, Michael A.; Marks, Tobin J.; Yang, Jian; Wong, George K.

CONTRACT NO. AFOSR-88-0105, NSF-DMR85-20280

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR 89-0655

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Chemistry of Materials, v1 n2 p167-169 1989.

ABSTRACT: (U) The creation and stabilization of microstructural acentricity is central to the successful design of polymeric materials with large quadratic optical nonlinearities. While significant preferential alignment of chromophore molecules doped into polymer glasses can be achieved by electric field poling, the pronounced temporal instability of such alignment, and hence the temporal instability of second harmonic generation (SHG) characteristics, remains an unsolved problem. These disorientation effects are a natural consequence of the dynamic processes by which glassy polymers undergo physical aging/relaxation to minimum free volume. We recently reported a promising approach to chromophore immobilization in which high-beta, nonlinear optical (NLO) chromophores are covalently bound to the backbone of a high-Tg, TB glassy polymer. We communicate here the development of a second, complementary approach in which a high beta guest chromophore is dispersed in an optically transparent host matrix that can then be simultaneously poled and chemically cross linked. Reprints (injm)

DESCRIPTORS: (U) POLYMERS, AGING(MATERIALS).

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI32L

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AD-A208 790 CONTINUED

NORTHWESTERN UNIV EVANSTON IL

(U) Persistent, Efficient Frequency Doubling by Poled  
Annealed Films of a Chromophore-Functionalized Poly(p-  
hydroxystyrene).

88

5P

PERSONAL AUTHORS: Ye, C.; Minami, N.; Marks, T. J.; Yang,  
J.; Wong, G. K.

CONTRACT NO. AFOSR-86-0105, NSF-DMR85-20280

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-89-0653

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Macromolecules, v21 n9 p2899-  
2901 1988.

ABSTRACT: (U) All synthetic strategies for polymeric  
second-harmonic generation (SHG) materials must address  
the crucial issues of maximizing chromophore densities  
while achieving maximum, persistent noncentrosymmetry. An  
attractive alternative to poling glassy polymers simply  
doped with nonlinear optical (NLO) chromophores are  
materials in which NLO chromophores are covalently linked  
to the polymer backbone, thus offering potential  
impediment both to phase separation at high chromophore  
densities and to deleterious relaxation of poling-induced  
chromophore alignment. We report here an embodiment of  
this strategy which employs structure-enforcing hydrogen-  
bond networks, achieves high chromophore densities, and  
affords polymer films with persistent (on a timescale of  
months) second-harmonic coefficients equal to or in  
excess of the corresponding value for LiNbO<sub>3</sub>. General  
observations relevant to NLO film processing and the  
applicability of current theoretical models are also  
reported. Lithium niobates, Polystyrenes, Reprints. (mjm)

DESCRIPTORS: (U) POLYMERIC FILMS, ANNEALING,  
CHROMOPHORES, EFFICIENCY, FILMS, FREQUENCY, LITHIUM  
NIOBATES, MODELS, PHASE, POLYMERS, POLYSTYRENE.

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AD-A208 789 CONTINUED

NORTHWESTERN UNIV EVANSTON IL

IDENTIFIERS: (U) PE61102F, WUAFOSR2303A3.

(U) Conductive Polymers Based upon Rigid-Rod Ultrahigh-Modulus Macromolecules. Electrochemical Doping of Poly(p-phenylenbenzobisthiazole-2,6-diyl) (PBT),

88 5P

PERSONAL AUTHORS: DePra, Patricia A.; Gaudiello, John G.; Marks, Tobin J.

CONTRACT NO. AFOSR-86-0105, NSF-DMR85-20280

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-89-0652

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Macromolecules, v21 n7 p2295-2297 1988.

ABSTRACT: (U) Rigid-rod benzobisthiazole based macromolecules, as exemplified by poly(p-phenylenbenzobisthiazole 2,6-diyl) (PBT, I), constitute some of the mechanically strongest and most robust polymeric substances known. Especially when processed into a highly ordered and crystalline microstructure, PBT exhibits impressive thermal and environmental stability as well as extremely high tensile strength and modulus. In addition to these characteristics, the architecture of the PBT pi-electron system suggests a possible pathway for delocalization and charge transport. We address here this latter issue and provide the first evidence the PBT can be electrochemically doped and undoped, either as thin coatings or as extruded, highly oriented free-standing films and fibers, to yield an electrically conductive polymer. Polymers, Thiazoles, Benzyl radicals, Reprints. (mjn)

DESCRIPTORS: (U) POLYMERS, BENZYL RADICALS, CHARGE TRANSFER, COATINGS, CONDUCTIVITY, ELECTRICAL CONDUCTIVITY, ENVIRONMENTS, HIGH STRENGTH, MACROMOLECULES, REPRINTS, TENSILE STRENGTH, THERMAL STABILITY, THIAZOLES, THINNESS.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EV132L

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AD-A208 788 CONTINUED

NORTHWESTERN UNIV EVANSTON IL

(U) Poled Polymeric Second Harmonic Generation Materials.  
Chemical Manipulation of the Temporal Characteristics  
of Electric Field-Induced Noncentrosymmetry.

88 9P

PERSONAL AUTHORS: Hubbard, M. A.; Minami, N.; Ye, C.;  
Marks, T. J.; Yang, J.

CONTRACT NO. AFOSR-88-0105, NSF-DNR85-20280

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-89-0656

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in SPIE V971 Nonlinear Optical  
Properties of Organic Materials p136-143 1988.

ABSTRACT: (U) This contribution describes two approaches to the construction of polymeric nonlinear optical materials with persistent second harmonic generation efficiency. In the first, poly(p-hydroxystyrene) is covalently functionalized with chromophores having large quadratic hyperpolarizabilities. Films of these polymers are poled at fields up to 1.8 MV/cm to yield materials with stable (on the timescale of months) second harmonic coefficients (d33) as high as 18 x 10 to the -9 power esu. In site measurements indicate that field-induced chromophore alignment is rapid at temperature substantially below T sub g and that relaxation of the alignment is even more rapid upon removal of the field. Annealing of the films prior to poling enhances the stability of second harmonic generation and allows poling at higher fields. A second approach is to disperse chromophores in an uncured epoxy host and to then simultaneously cure and pole the resulting ensembles. This procedure also stabilizes preferential chromophore alignments for relatively long periods of time. Reprints. (AW)

DESCRIPTORS: (U) OPTICAL MATERIALS. POLYMERS.

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ALIGNMENT, ANNEALING, CHROMOPHORES, COEFFICIENTS, EFFICIENCY, ELECTRIC POWER, FILMS, HARMONIC GENERATORS, HARMONICS, LONG RANGE(TIME), MATERIALS, MEASUREMENT, NONLINEAR SYSTEMS, RELAXATION, REMOVAL, REPRINTS, SITES, TEMPERATURE, YIELD, SYMMETRY.

IDENTIFIERS: (U) PE61102F, MUADSR2303A3, \*Second harmonic generation materials, Noncentrosymmetry, Hyperpolarization, Polyhydroxystyrenes.

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EV132L

AD-A208 784 CONTINUED

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HAWAII INST OF GEOPHYSICS HONOLULU

(U) Yield Estimation from Spectral Amplitudes of Direct P and P Coda Recorded by the Wake Island Deep Ocean Hydrophone Array.

OCT 87 21P

PERSONAL AUTHORS: McCreery, Charles S.

REPORT NO. HIG-CONTRIB-1892

CONTRACT NO. AFOSR-89-0339

PROJECT NO. 2309

TASK NO. A2

MONITOR: AFOSR  
TR-89-0717

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Bulletin of the Seismological Society of America, v77 n5 p1748-1766 Oct 87.

ABSTRACT: (U) Spectral amplitudes of direct P and P coda between 0.5 and 6 Hz were measured for 14 Eastern Kazakh test explosions using 8 hydrophones of the Wake Island Array(WIA). A new model for these data was developed to estimate relative yields of those explosions. Each log spectral amplitude is considered to be the sum of four parameters and an error term. The 3 frequency-dependent parameters represent: 1) the average Eastern Kazakh spectrum at the WIA; 2) the spectral shape characteristics unique to each event; and 3) the station or hydrophone corrections. The fourth parameter represents relative yield. A total of 346 parameters, were needed to model all 901 spectral amplitudes that were measured, and first-order linear regression technique were used to invert the data for these parameters. Standard deviations of the computed relative yields are very small. Deviations between the relative yields and their corresponding relative NEIS body wave magnitudes, however, are larger. This difference is interpreted to be an indicator of the level of inhomogeneity in the worldwide pattern of energy radiated from Eastern Kazakh tests. It is proposed that the yield of a large explosion

might be disguised by siting the explosion at a location that selectively defocuses energy towards continents where most seismic stations are located. Reprints. (EDC)

DESCRIPTORS: (U) \*SEISMIC WAVES, \*PRIMARY WAVES(SEISMIC WAVES), AMPLITUDE, CORRECTIONS, ENERGY, ESTIMATES, GLOBAL, HETEROGENEITY, HYDROPHONES, LINEAR REGRESSION ANALYSIS, MATHEMATICAL MODELS, PARAMETERS, PATTERNS, REPRINTS, SHAPE, SPECTRA, STANDARD DEVIATION, TEST AND EVALUATION, YIELD, NUCLEAR EXPLOSIONS, UNDERGROUND EXPLOSIONS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2309A2, Wake Island Deep Ocean Hydrophone Array, \*Coda(Seismic waves).

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HAWAII INST OF GEOPHYSICS HONOLULU

(U) Po/So Phases: Propagation Velocity Across a 1,500-km-Long, Deep Ocean Hydrophone Array.

87 17P

DESCRIPTORS: (U) \*SEISMIC WAVES, ACOUSTIC ARRAYS, ANISOTROPY, AZIMUTH, BIAS, DEEP OCEANS, EARTHQUAKES, EPICENTERS, HYDROPHONES, INTERCEPTION, LOW VELOCITY, NORTH PACIFIC OCEAN, PATHS, REPRINTS, TRAVEL, TRAVEL TIME, VELOCITY, WAVE PROPAGATION, LITHOSPHERE, PRIMARY WAVES(SEISMIC WAVES), SEISMIC ARRAYS, SEISMIC DATA.

PERSONAL AUTHORS: Walker, Daniel A.; McCreery, Charles S.

IDENTIFIERS: (U) PE61102F, WUAFOSR2309A2, Seismic velocity, Northwest Pacific Ocean.

REPORT NO. HIG-CONTRIB-1903

CONTRACT NO. AFOSR-89-0339

PROJECT NO. 2309

TASK NO. A2

MONITOR: AFOSR  
TR-89-0718

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Physics of the Earth, v35 p111-125 1987.

ABSTRACT: (U) Pd/So phases from numerous earthquakes along the margin of the Northwestern Pacific Basin were successfully recorded by a 1,5000 by a 1,5000-km-long ocean bottom hydrophone (OBH) array deployed for two months near Wake Island. Data from ten shallow-focus (<100km) events at 20 deg (2,2000 km) to 34 deg (3,8000 km) epicentral distance were used to compute propagation velocities across the array for the onsets of Po and So. The values found are  $7.96 \pm 0.05$  km/s for Po and  $4.58 \pm 0.06$  km/s for So. Travel-time intercepts associated with these velocities are, respectively,  $-7.21$  plus or minus  $2.40$  s and  $-12.84$  plus or minus  $7.61$  s. These velocities are significantly lower than those previously reported for the Northwestern Pacific using single station data. Although the low velocities and negative intercepts could simply be the result of bias in the data, they might also be due to the effects of azimuthal anisotropy along travel paths, or to increasing propagation velocity with lithospheric age, or to a different mode of propagation near the source. Keywords: Primary seismic wave velocity; Earthquake epicenters; Wave propagation; Reprints. (EDC)

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SEARCH CONTROL NO. EVI32L

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AD-A208 774 7/4

GEORGIA UNIV ATHENS CENTER FOR COMPUTATIONAL QUANTUM CHEMISTRY

GEORGIA UNIV ATHENS CENTER FOR COMPUTATIONAL QUANTUM CHEMISTRY

(U) The Anharmonic Force Fields of Silyl Fluoride and Silyl Chloride.

(U) The Silanolic Acid Dimer (HSiOOH)<sub>2</sub>: A Simple Molecular System Incorporating Two Very Strong Hydrogen Bonds.

88 15P

89 7P

PERSONAL AUTHORS: Yamaguchi, Yukio; Schaefer, Henry F., III

PERSONAL AUTHORS: Seidl, Edward T.; Schaefer, Henry F., III

REPORT NO. CCQC-CONTRIB-26

REPORT NO. CCQC-CONTRIB-29

CONTRACT NO. AFOSR-88-0167

CONTRACT NO. AFOSR-87-0182

PROJECT NO. 2303

PROJECT NO. 2303

TASK NO. B3

TASK NO. B3

MONITOR: AFOSR  
TR-89-0691

MONITOR: AFOSR  
TR-89 0693

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Molecular Spectroscopy, v132 p193-206 1988.

SUPPLEMENTARY NOTE: Pub. in Jnl. of the American Chemical Society, v111 n5 p1569-1574 1989.

ABSTRACT: (U) The complete cubic and quartic force fields of H<sub>3</sub>SiF and H<sub>3</sub>SiCl are predicted from ab initio SCF calculations using the 6-31G basis set. The computed geometries, rotational constants, vibrational wavenumbers, anharmonicity constants, vibration-rotation interaction constants, 1-doubling constants, Coriolis coupling constants, and centrifugal distortion constants are compared with the available experimental data. Many experimental unknown spectroscopic constants are predicted, especially for D<sub>3</sub>SiF and D<sub>3</sub>SiCl. Reprints. (AW)

DESCRIPTORS: (U) \*SILICON COMPOUNDS, \*FORCE(MECHANICS), CENTRIFUGAL FIELDS, CONSTANTS, CORIOLIS EFFECT, COUPLING(INTERACTION), DISTORTION, EXPERIMENTAL DATA, QUARTIC EQUATIONS, REPRINTS, ROTATION, SPECTROSCOPY, CHLORIDES, FLUORIDES.

IDENTIFIERS: (U) PEG1102F, WJAFOSR2303B3, \*Silyl chloride, \*Silyl fluoride, \*Force fields, \*Anharmonic force fields.

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DESCRIPTORS: (U) \*DIMERS, \*MOLECULAR STRUCTURE, \*SILICON COMPOUNDS, ACIDS, BONDING, CHEMICAL DISSOCIATION, ELECTRONICS, ENERGY, FREQUENCY, HYDROGEN BONDS, INFRARED SPECTRA, MONOMERS, REPRINTS, SILICON, THEORY, VIBRATION, ORGANIC ACIDS.

IDENTIFIERS: (U) PEG1102F, WJAFOSR2303B3.

ABSTRACT: (U) Ab initio molecular electronic structure theory has been used to predict and characterize the remarkable species (HSiOOH)<sub>2</sub>. The dissociation energy to two silanolic acid monomers is predicted to be D sub O + 25 kcal/mol, twice that observed for the well-characterized valence isoelectronic formic acid dimer. Fundamental vibrational frequencies allowed in the infrared spectrum are predicted as follows: v(O-H) = 2905/cm, v(Si=O) = 1229/cm, and v(Si-O) = 955/cm. By avoiding formal double bonds to silicon, a much lower energy cyclic isomer of the silanolic acid dimer may be found, and this structure is also theoretically characterized. Reprints. (AW)

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI32L

AD-A208 763 20/11

AD-A208 763 CONTINUED

COMPUTATIONAL MECHANICS CO INC AUSTIN TX

Structural dynamics, Elastohydrodynamic lubrication. (MJM)

(U) Computational Methods for Nonlinear Dynamic Problems in Solid and Structural Mechanics: Progress in the Theory and Modeling of Friction and in the Control of Dynamical Systems with Frictional Forces.

DESCRIPTORS: (U) \*NUMERICAL METHODS AND PROCEDURES, \*STRUCTURAL MECHANICS, AGREEMENTS, CONTROL, CONTROL SYSTEMS, DAMPING, DISTRIBUTION, DYNAMICS, EXCITATION, FRICTION, HOMOGENEITY, HYDRODYNAMICS, HYDROELASTICITY, LUBRICATION, MATHEMATICAL ANALYSIS, MODELS, MOTION, NONLINEAR SYSTEMS, NUMERICAL ANALYSIS, OPTIMIZATION, OSCILLATION, SELF OPERATION, STATISTICS, STRUCTURAL PROPERTIES, THEORY, VISCOELASTICITY.

DESCRIPTIVE NOTE: Final technical rept. 1 Nov 88-28 Feb 89.

MAR 89 405P

IDENTIFIERS: (U) PEB1102F, WUAFOSR2302B1.

PERSONAL AUTHORS: Oden, J. T.; Tworzydlo, W. W.; Martins, J. A.

REPORT NO. TR-89-05

CONTRACT NO. F49620-86-C-0051

PROJECT NO. 2302

TASK NO. B1

MONITOR: AFOSR TR-89-0627

UNCLASSIFIED REPORT

ABSTRACT: (U) This final report summarizes work on a three-year project devoted to dynamic friction and on control of systems with frictional forces. Detailed theoretical and numerical studies of static and dynamic friction and various phenomena of dynamic friction (stick-slip motion, self-excited oscillations, frictional damping, etc.) are described. Included in the report is also a study of methods of statistical homogenization, devised to develop new micromechanics based models of contact and friction. The question of optimal control with distributed dynamical systems of viscoelastic bodies with frictional forces is also described. A final component of this study focuses on the mathematical and numerical analysis of elastohydrodynamic lubrication problems and is included in the final chapter. The studies presented in this report provide both a theoretical and numerical basis for modeling contact and friction. These models are shown to produce results in very good qualitative and quantitative agreement with experimental results. Keywords: Friction, Damping.

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AD-A208 738 6/11

PURDUE UNIV LAFAYETTE IN SCHOOL OF ELECTRICAL ENGINEERING

OREGON STATE UNIV CORVALLIS DEPT OF FISHERIES AND WILDLIFE

(U) The Pasm Parallel Processing System: Design, Simulation, and Image Processing Applications. Volume 1.

(U) A Characterization of Chlordecone Pretreatment - Altered Pharmacokinetics in Mice.

DESCRIPTIVE NOTE: Final rept. 1 Jan 86-31 Dec 89.

89 9P

DEC 89 394P

PERSONAL AUTHORS: Kuehn, James T.

PERSONAL AUTHORS: Carpenter, Hillary M.; Curtis, Lawrence R.

CONTRACT NO. F49620-86-K-0006, F30602-78-0025

CONTRACT NO. AFOSR-87-0185

MUNITOR: AFOSR TR-89-0731

PROJECT NO. 2312

TASK NO. A5

UNCLASSIFIED REPORT

MONITOR: AFOSR TR-89-0686

SUPPLEMENTARY NOTE: Doctoral thesis. Sponsored in part by Contracts F30602-C-0193, F30602-83-K-0119 and Grants AFOSR-78-3581 and DAAG29-82-K-0101.

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Drug Metabolism and Disposition, v17 n2 p131-138 1989.

ABSTRACT: (U) Advances in device and packaging technologies are producing incremental gains in the performance of computer systems. However, these gains are being more than offset by new applications having a need to process large data sets, a need real-time computation, or other requirements which make them prohibitively expensive to perform on conventional computer systems. This has forced computer architects to consider parallel/distributed computer designs. In Part I of this thesis, the strengths and weaknesses of a variety of existing and proposed parallel computer designs are examined. These characteristics are used to motivate and support the design decisions made for a particular parallel computer architecture, PASM. It is PASM that is the primary focus of the work in this thesis. (RH)

DESCRIPTORS: (U) \*COMPUTER ARCHITECTURE, \*IMAGE PROCESSING, \*PARALLEL PROCESSING, \*PARALLEL PROCESSORS, \*SIMULATION, \*SYSTEMS ENGINEERING, ARCHITECTIS, COMPUTATIONS, COMPUTERS, DISTRIBUTION, PACKAGING, PERFORMANCE(ENGINEERING), REAL TIME.

IDENTIFIERS: (U) PE61102F.

AD A208 739

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ABSTRACT: (U) Lipophilic chlorinated hydrocarbons pose a potential health hazard to humans and animals and the toxicity of a number of these compounds has been well documented. Despite the low environmental concentrations of most of these chemicals, much of the research conducted to date has used maximally tolerated doses. Our research, conducted with low, apparently nontoxic, doses of the insecticide chlordecone (CD), showed that the administration of CD (5 mg/kg ip) to mice (C57BL/6N and DBA/2N strains) caused a time-dependent alteration in the pattern of distribution of subsequently administered dose of (carbon 14)CD. Livers of CD-pretreated animals contained less label than did those from controls and CD pretreatment increased amounts of label in kidney, lung, fat, and muscle. Changes did not appear to be due to an altered rate of metabolism and analysis of total CD in tissues (unlabeled plus (14C)CD) indicated that these responses were not due to a simple redistribution phenomenon. We have termed this preexposure effect a pretreatment disposition response (PDR) and feel it may reflect an important cellular response to lipophilic compounds. CD induced PDR is dose related, exhibits a threshold, and is saturable at a given level of induction.

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AD-A208 736 12/3

Reprints. (AW)

MASSACHUSETTS UNIV AMHERST DEPT OF MATHEMATICS AND STATISTICS

DESCRIPTORS: (U) \*INSECTICIDES, \*PHARMACOKINETICS, \*TOXIC TOLERANCES, ANIMALS, CELLS(BIOLOGY), CHEMICALS, CONCENTRATION(COMPOSITION), DISTRIBUTION, DOSAGE, ENVIRONMENTS, TOXIC HAZARDS, HEALTH, HUMANS, LOW LEVEL, LUNG, METABOLISM, MICE, PATTERNS, RATES, REPRINTS, RESPONSE(BIOLOGY), TOXICITY, SUBLETHAL DOSAGE.

(U) Applications of Functional Analytical Methods to Problems in Queueing Network Theory and Reliability Theory.

DESCRIPTIVE NOTE: Final rept..

IDENTIFIERS: (U) PE61102F, WUAFOSR2312A5.

OCT 80 2P

PERSONAL AUTHORS: Rosenkrantz, Walter A.

CONTRACT NO. F49620-79-C-0209

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR 89-0679

UNCLASSIFIED REPORT

ABSTRACT: (U) The diffusion approximation for queueing networks is proved via the Trotter-Kato Theorem. This involves delicate calculations involving the domains of certain operators some of which have been successful and some not. One tries to solve the martingale problem instead of characterizing the domain and hopes to use the Stroock-Varadhan approach in order to prove the corresponding limit theorem. For example, we solve the martingale problem for a class of Markov processes whose infinite signal generators are integro-differential operators. Extensions of these results to more complicated queueing systems are currently in progress. Publications: (1) On the Accuracy of Kingman's Heavy Traffic Approximation in the Theory of Queues; (2) Limit theorems for Markov processes via a variant of the Trotter-Kato theorem; and (3) On an integro-differential equation occurring in Queueing and Storage theory. (jhd)

DESCRIPTORS: (U) \*QUEUEING THEORY, \*RELIABILITY, \*FUNCTIONAL ANALYSIS, ACCURACY, DIFFERENTIAL EQUATIONS, DIFFUSION, INTEGRAL EQUATIONS, MARKOV PROCESSES, NETWORKS, RELIABILITY, STORAGE, THEORY, TRAFFIC.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A5.

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AD-A208 722 15/6

Intergodifferential equations, Martingales(Mathematics),  
Trotter kato theorem.

ROCHESTER UNIV NY GRADUATE SCHOOL OF MANAGEMENT  
(U) Final Technical Report for Grant AFOSR-79-0043  
(University of Rochester, Graduate School of  
Management).

DESCRIPTIVE NOTE: Final rept. 1 Jul 79 30 Jul 81.

DEC 81 3P

PERSONAL AUTHORS: Keilson, J.

CONTRACT NO. AFOSR-79-0043

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR-89-0680

UNCLASSIFIED REPORT

DESCRIPTORS: (U) \*LOGISTICS MANAGEMENT, MATHEMATICAL  
MODELS.

IDENTIFIERS: (U) WUAFOSR2304A5, PE61102F.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI32L

AD-A208 720 CONTINUED

GEORGIA UNIV RESEARCH FOUNDATION INC ATHENS

(U) Theoretical Investigations of Molecules Composed only of Fluorine, Oxygen and Nitrogen: Determination of the Equilibrium Structures of F<sub>2</sub>O<sub>2</sub>, (NO)<sub>2</sub> and FNNF and the Transition State Structure for FNNF cis-trans isomerization.

ATOMS, CLUSTERING, CONFIGURATIONS, CORRELATION, COUPLING(INTERACTION), ELECTRONS, EQUILIBRIUM(GENERAL), FUNCTIONS, INTERACTIONS, MOLECULES, PARTICLES, POLARIZATION, PREDICTIONS, RELIABILITY, REPRINTS, THEORY, TRANSITIONS, ISOMERIZATION, TRANSITIONS.

IDENTIFIERS: (U) WUAFOSR230383, PE61102F.

89 19P

PERSONAL AUTHORS: Lee, Timothy J.; Rice, Julia E.; Scuseria, Gustavo E.; Schaefer, Henry F., III

CONTRACT NO. AFOSR-87-0182

PROJECT NO. 2303

TASK NO. B3

MONITOR: AFOSR  
TR-89-0692

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Theoretical Chimica Acta v75  
p81-98 1989.

ABSTRACT: (U) The deficiencies of common ab initio methods for the reliable prediction of the equilibrium structures of compounds composed of only the fluorine, oxygen and nitrogen atoms are investigated. Specifically, the importance of using large one-particle basis sets with multiple sets of polarization functions has been studied. Additionally, the need for a set of f basis functions was investigated. Several different single reference electron correlation methods have been tested in order to determine whether it is possible for a single reference based method to be routinely used on such chemical systems. These electron correlation methods include second order Moller-Plesset perturbation theory (MP2), singles and doubles configuration interaction (CISD), the coupled pair functional (CPF) approach and singles and doubles coupled cluster (CCSD) theory. Keywords: Theoretical chemistry, Quantum chemistry, Reprints. (AW)

DESCRIPTORS: (U) \*FLUORINE COMPOUNDS, \*NITROGEN, \*OXYGEN COMPOUNDS, \*QUANTUM CHEMISTRY, \*MOLECULAR STRUCTURE.

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AD-A208 717 CONTINUED

RHODE ISLAND UNIV KINGSTON DEPT OF MECHANICAL  
ENGINEERING AND APPLIED MECHANICS

(U) Probabilistic Description of Fatigue Crack Growth  
Under Constant-and Variable-Amplitude Loading.

DESCRIPTIVE NOTE: Final rept..

MAR 89 188P

PERSONAL AUTHORS: Ghonem, H.; Zeng, M.

CONTRACT NO. AFOSR-85-0362

PROJECT NO. 2302

TASK NO. B2

MONITOR: AFOSR  
TR-89-0716

UNCLASSIFIED REPORT

ABSTRACT: (U) This report is concerned with the description of the development and application of a stochastic crack growth model. It is built as a discontinuous Markov process and is inhomogeneous with respect to the number of cycles required for the crack to reach a specified crack length. The model is then used to describe the evolution of the crack length in terms of growth curves, each of whose points possess equal probability of advancing from one position to another forward position. The validity of the model is established by applying it to constant-as well as to variable amplitude loading. In those applications the theoretical constant probability crack growth curves generated by the model compared to those experimentally obtained using Al 7075 T6 and Al 2024-T3 material for constant-amplitude loading while Ti-6Al-4V was used in single overload application. Results of these comparisons indicate the ability of the proposed model when fitted with parameters whose values can be obtained from a limited numbers of experimental tests, to predict the crack growth statistics under different loading conditions. Keywords: Crack; Overload; Stochastic process; Retardation; Titanium alloy; Aluminum alloys; Vanadium. (kt)

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DESCRIPTORS: (U) \*ALUMINUM ALLOYS, \*CRACK PROPAGATION, \*FATIGUE(MECHANICS), \*TITANIUM ALLOYS, \*VANADIUM, AMPLITUDE, CRACKS, CYCLES, EXPERIMENTAL DESIGN, FORWARD AREAS, LENGTH, MARKOV PROCESSES, MATHEMATICAL MODELS, MODELS, OVERLOAD, POSITION(LOCATION), PROBABILITY, STATISTICS, LOADS(FORCES), STOCHASTIC PROCESSES, TEST METHODS, VALIDATION, VARIABLES.

IDENTIFIERS: (U) WUAFOSR2302B2, PE61102F



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## DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI32L

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AD-A208 695 6/5 5/8 6/4 9/5

ILLINOIS UNIV AT URBANA DEPT OF MATERIALS SCIENCE AND  
ENGINEERING

NORTHWESTERN UNIV EVANSTON IL CRESAP NEUROSCIENCE LAB

(U) High Temp Toughening and Creep Studies.

(U) Perception of Motion in Statistically-Defined Displays.

DESCRIPTIVE NOTE: Final rept. 1 Jun 85-28 Feb 89.

DESCRIPTIVE NOTE: Final scientific rept. 1 Oct 85-30 Sep  
88.

MAY 89 128P

APR 89 278P

PERSONAL AUTHORS: Kriven, Waltraud M.

PERSONAL AUTHORS: Sekuler, Robert

CONTRACT NO. AFOSR-85-0242

CONTRACT NO. AFOSR-85-0370

PROJECT NO. 2306

PROJECT NO. 2313

TASK NO. A2

TASK NO. A5

MONITOR: AFOSR  
TR-89-0688MONITOR: AFOSR  
TR-89-0769

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) Early in 1985, the lanthanide sesquioxides (Ln2O3) were identified as potential high temperature transformation tougheners alternative to zirconia (ZrO2). Their 8-10% volume increase accompanying the monoclinic (B) to cubic (C) transformation suggested that they should be more powerful than ZrO2. In addition, the Ms temperature was raised up to 2200 C indicating that, based on thermodynamics alone, transformation toughening up to this temperature should be possible. Hence a proposal was written with the aim of transformation toughening silicon carbide (SiC) with dispersions of monoclinic dysprosia particles giving a microstructure analogous to Zirconia-toughened-alumina (ZTA). Keywords: Composite materials; Cracking; Graphite; Sintering; Silica; Annealing; Silicon carbides. (kt)

DESCRIPTORS: (U) \*COMPOSITE MATERIALS, \*CHEMICAL REACTIONS, ANNEALING, CRACKS, CREEP, GRAPHITE, MICROSTRUCTURE, PARTICLES, SILICON CARBIDES, SILICON DIOXIDE, SINTERING, THERMODYNAMICS, ZIRCONIUM OXIDES, ALUMINUM.

IDENTIFIERS: (U) PE61102F, WUAFOSR2306A2, Lanthanide sesquioxides, Zirconia.

AD-A208 714

AD-A208 695

## UNCLASSIFIED

ABSTRACT: (U) This project used statistically complex displays to probe higher-orders of human motion perception. The project's overall aim was to establish the characteristics of human visual mechanisms that extract information from these and other displays. A fundamental contribution was the systematic refinement and extension of a model in which motion information is extracted and processed, via non-linear interactions, by directionally-selective visual mechanisms. Prior work has shown that a percept of global coherent motion can be produced from the combination of many different, localized motion vectors. Using random-dot cinematograms, we established that hysteresis is strongly associated with such percepts. It was previously found that practice seemed to produce direction-selective improvement in observers' ability to discriminate between highly similar directions of motion. Investigators clarified the basis for this improvement by recording an observers eye movements while they target motion. Investigators also created random dot cinematograms in which each dot's successive movements were independently drawn from a Gaussian distribution of directions of some characteristic bandwidth. Such displays, comprising many different, spatially intermingled local motion vectors, can produce a percept of global coherent motion in a single direction. Keywords: motion visual perception;

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AD A208 695 CONTINUED

AD-A208 686 9/1 9/6 20/6 20/1  
17/9 20/14

Math models; Statistical displays; Cinematograms. (EDC)

DESCRIPTORS: (U) \*DISPLAY SYSTEMS, \*MOTION, \*SPACE PERCEPTION, COHERENCE, DISCRIMINATE ANALYSIS, EYE MOVEMENTS, GLOBAL, HUMANS, HYSTERESIS, INTERACTIONS, MATHEMATICAL MODELS, MOVING TARGETS, NONLINEAR SYSTEMS, NORMAL DISTRIBUTION, OBSERVERS, ORIENTATION(DIRECTION), PERCEPTION(PSYCHOLOGY), REFINING, STATISTICS, VISION, VISUAL AIDS, VISUAL PERCEPTION, MATHEMATICAL MODELS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2313A5, \*Motion perception, Cinematograms, Statistical displays.

CALIFORNIA INST OF TECH PASADENA DEPT OF ELECTRICAL ENGINEERING

(U) Acoustoptic Processing of Two Dimensional Signals  
Using Temporal and Spatial Integration.

DESCRIPTIVE NOTE: Final rept. 1 May 88-28 Feb 89.

MAY 89 1:6P

PERSONAL AUTHORS: Psaltis, Demetri; Hong, John; Hudson, Scott; Yu, Jeff, Mok, Fai

CONTRACT NO. AFOSR 85-0332

PROJECT NO. 2305

TASK NO. B1

MONITOR: AFOSR  
TR-89-0730

UNCLASSIFIED REPORT

ABSTRACT: (U) Acoustoptic signal processing architectures and methods are developed for a variety of 2-D problems. A formulation of the inverse synthetic aperture radar problem as an energy minimization procedure is reported. Acoustoptic systems for multiple target detection and 2-D spectrum analysis are experimentally demonstrated. The application of acoustoptics to the adaptive beam-forming for broadband antenna arrays is described. (RH)

DESCRIPTORS: (U) \*ACOUSTOPTICS, \*ADAPTIVE SYSTEMS, \*ANTENNA ARRAYS, \*BEAM FORMING, \*BROADBAND ANTENNAS, \*SIGNAL PROCESSING, \*SYNTHETIC APERTURE RADAR, \*TARGET DETECTION, ARCHITECTURE, MULTIPLE OPERATION, PROCESSING, SIGNALS, TARGETS, TWO DIMENSIONAL.

IDENTIFIERS: (U) PE61102F, WUAFOSR2305B1

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## UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI32L

AL A208 682

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AD-A208 681

12/1

SAN DIEGO STATE UNIV CA DEPT OF ELECTRICAL AND COMPUTER  
ENGINEERING

NEW YORK UNIV NY COURANT INST OF MATHEMATICAL SCIENCES  
(U) Conference on Mathematical Frontiers and the Physical  
World.

(U) Electron Attachment Rate Constants of HBr, CH<sub>3</sub>Br, and  
C<sub>2</sub>H<sub>5</sub>Br in N<sub>2</sub> and Ar.

DESCRIPTIVE NOTE: Final rept. 9 Jan 81-28 Feb 82.

MAY 88

6P

JUL 82

2P

PERSONAL AUTHORS: Wang, W. C.; Lee, L. C.

PERSONAL AUTHORS: Varadhan, S. R.

CONTRACT NO. AFOSR-86-0205

CONTRACT NO. AFOSR-ISSA-81-00037, NSF-MCS81-09183

PROJECT NO. 2301

PROJECT NO. 2304

TASK NO. A7

TASK NO. A4

MONITOR: AFOSR

MONITOR: AFOSR

TR-89-0694

TR-89-0739

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Applied Physics, v63  
n10 p4905-4910, 15 May 88.

ABSTRACT: (U) The electron attachment rate constants of  
bromine compounds in the buffer gases of N<sub>2</sub> and Ar  
(approx. 250 Torr) were measured as a function of E/N (or  
mean electron energy electron energy). The measured  
electron attachment rate constants of HBr, CH<sub>3</sub>Br, and  
C<sub>2</sub>H<sub>5</sub>Br show maximum values of 1.05x10 to the 9th, 1.08x  
10 to the 11th, and 9.3x10 to the 11th cc/s at mean  
electron energies of 0.55, 0.4, and 0.8 eV respectively.  
The electron drift velocities for the gas mixtures of  
CH<sub>3</sub>Br in N<sub>2</sub> and Ar were also measured. Electron  
attachment, Rate constants, Measurements, Laser beam  
wavelength, Nitrogen, Argon, Methyl bromide, Ethyl  
radicals, Hydrogen bromide, Reprints. (mjn)

DESCRIPTORS: (U) \*ARGON, \*ETHYL RADICALS, \*HYDROGEN  
COMPOUNDS, ATTACHMENT, BROMIDES, BROMINE COMPOUNDS,  
CONSTANTS, DRIFT, ELECTRON ENERGY, ELECTRONS, FREQUENCY,  
LASER BEAMS, MEAN, METHYL RADICALS, NITROGEN, RATES,  
REPRINTS, VALUE, VELOCITY.

IDENTIFIERS: (U) PEG1102F, WJAFOSR2301A7.

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AD A208 680 12/3

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PITTSBURGH UNIV PA DEPT OF MATHEMATICS AND STATISTICS

(U) International Symposium on Multivariate Analysis (5th)  
Held in Pittsburgh, Pennsylvania on June 19-24, 1978.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2304A5.

DESCRIPTIVE NOTE: Final rept..

79 14P

PERSONAL AUTHORS: Krishnalah, P. R.

CONTRACT NO. AFOSR-78-3548

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR 89-0740

UNCLASSIFIED REPORT

ABSTRACT: (U) The Fifth International Symposium on Multivariate Analysis was held at the University of Pittsburgh during the period of June 19-24, 1978. In this volume, distinguished workers in the field from many countries discuss the current developments on a very broad spectrum of topics in the theory and applications of multivariate analysis. The topics covered include classification and pattern recognition, contingency tables, decomposition of multivariate probabilities, design and analysis of experiments, distribution theory, econometric estimation, limit theorems, multivariate analysis of variance, non-parametric methods, optimum properties of test procedures, psychometrics, random matrices, reduction of dimensionality, reliability, scaling methods, simultaneous test procedures, sociometry, statistical physics, stochastic control theory, time series and stochastic processes. (KR)

UNSCRIPTORS: (U) \*MULTIVARIATE ANALYSIS, \*SYMPOSIA, ANALYSIS OF VARIANCE, CONTROL THEORY, DECOMPOSITION, DISTRIBUTION THEORY, ECONOMETRICS, ESTIMATES, INTERNATIONAL, NONPARAMETRIC STATISTICS, OPTIMIZATION, PATTERN RECOGNITION, PENNSYLVANIA, PHYSICS, PROBABILITY, PSYCHOMETRICS, RELIABILITY, SCALING FACTORS, STATISTICS, STOCHASTIC CONTROL, STOCHASTIC PROCESSES, SYNCHRONISM, TEST METHODS, TIME SERIES ANALYSIS.

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## DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI32L

AD-A208 679 20/12 20/2 7/2 20/8 20/5

MARYLAND UNIV COLLEGE PARK DEPT OF MATHEMATICS

(U) Binary Time Series.

DESCRIPTIVE NOTE: Final rept..

JUL 80 2P

PERSONAL AUTHORS: Kedem, B.; Slud, E.

CONTRACT NO. F49620-79-C-0095

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR-89-0674

## UNCLASSIFIED REPORT

ABSTRACT: (U) This research dealt with higher order crossings, quantities which were defined and proved to be useful in discrimination in time series. In particular the Higher Order Crossings Theorem has been proved and a new goodness of fit and discrimination statistic has been suggested and applied in testing model adequacy in ARIMA processes, and in discrimination in EEG data. A connection with an application to particle arrangements in physics has been found and a quantity called an m'th order unit has been defined. This has been applied in finding the distribution of rare events in Binary Series. (KR)

DESCRIPTORS: (U) \*BINARY ARITHMETIC, \*TIME SERIES ANALYSIS, CROSSINGS, DISTRIBUTION, ELECTROENCEPHALOGRAPHY, EXPERIMENTAL DATA, PARTICLES, PHYSICS, THEOREMS.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2304A5, \*Binary series.

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OREGON UNIV EUGENE DEPT OF PHYSICS

(U) Photoionization Phenomena Near Threshold.

89 11P

PERSONAL AUTHORS: Crasemann, B.

CONTRACT NO. AFOSR-87-0026

PROJECT NO. 2301

TASK NO. A4

MONITOR: AFOSR  
TR-89-0704

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Comments on Atomic and Molecular Physics, v22 n4 p163-172 1989.

ABSTRACT: (U) Dynamic correlation effects produce a multifaceted many-electron response when the atomic electron core is photoionized. Drastic changes in rearrangement take place as the incident photons are tuned from threshold to high energy and the ionization mechanism evolves from a single second-order quantum process to a sequence of discrete excitation, relaxation, and decay phases. Post-collision interaction links these very different regimes, and resonant scattering theory permits a unified treatment. The study of the near-threshold behavior of dynamic correlation satellites and of post-collision interaction phenomena holds promise of further elucidating this intricate subject. Keywords: Atomic physics, Inner-shell processes, Atomic rearrangement dynamics, Correlation satellites, Post-collision interaction, Resonant Raman transitions, Synchrotron radiation, Reprints. (AW)

DESCRIPTORS: (U) \*PHOTOIONIZATION, \*THRESHOLD EFFECTS, CORRELATION, DECAY, DYNAMICS, EXCITATION, HIGH ENERGY, IONIZATION, NUCLEAR PHYSICS, PHASE, PHOTONS, RADIATION, RAMAN SPECTRA, REPRINTS, RESONANCE, SCATTERING, SEQUENCES, SYNCHROTRONS, THEORY, TRANSITIONS.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2301A4, Inner shell processes, Atomic rearrangement, Correlation satellites.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EV132L

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SMITH-KETTLEWELL EYE RESEARCH FOUNDATION SAN FRANCISCO  
CA

IDENTIFIERS: (U) PEG1102F, WUAFOSR2313A5, Parallax.

(U) Is There a Constancy for Velocity?

89 10P

PERSONAL AUTHORS: McKee, Suzanne P.; Welch, Leslie

CONTRACT NO. AFOSR-85-0380

PROJECT NO. 2313

TASK NO. A5

MONITOR: AFOSR  
TR-89-0727

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Vision Research, v29 n5 p553-  
561 1989.

ABSTRACT: (U) Human observers are unable to use disparity information to transform the angular velocity signal into a precise object-based code. The Weber fraction for discriminating changes in objective velocity (cm/sec) is about twice the Weber fraction for discriminating changes in angular velocity (deg/sec), and is substantially higher than predicted from a combination of the errors in judging disparity and angular velocity. By comparison, judgments of the distance traversed by the moving target show excellent size constancy. The discrimination of changes in objective size (cm) is as precise as the discrimination of changes in angular size (deg). The angular velocity signal is useful without transformation into an object-centered signal; it guides eye and body movements, and is the basis of motion parallax judgments. The need to retain this angular signal may explain why there is no efficient mechanism for velocity constancy. Keywords: Visual perception; Motion; Velocity; Discrimination; Size discrimination; Size constancy; Velocity constancy; Reprints. (JMD)

DESCRIPTORS: (U) MOTION, VISUAL PERCEPTION, ANGLES, ANGULAR MOTION, DISCRIMINATION, EFFICIENCY, ERRORS, HUMANS, MOVING TARGETS, OBSERVERS, REPRINTS, SIGNALS, SIZES(DIMENSIONS), VELOCITY.

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AD-A208 664 CONTINUED

MARYLAND UNIV COLLEGE PARK DEPT OF ELECTRICAL  
ENGINEERING

IDENTIFIERS: (U) PEG1102F, WUAFDSR2301A8.

(U) Studies of the Propagation of Short Burst, High Power  
Microwave Radiation through Neutral and Ionized Media.

DESCRIPTIVE NOTE: Final rept. 1 Dec 85-30 Nov 88.

MAR 89 84P

PERSONAL AUTHORS: Destler, William W.; Striffler, Charles  
D.

CONTRACT NO. AFDSR-86-0046

PROJECT NO. 2301

TASK NO. AB

MONITOR: AFOSR  
TR-89-0710

UNCLASSIFIED REPORT

ABSTRACT: (U) Experiments were completed on the  
propagation of very high power (500 kw/cmsq), short burst  
(3-30 ms) microwaves through a neutral media. Results  
indicate that breakdown field strengths are about a  
factor of two higher when the test cell is shielded from  
x rays generated by the microwave source. Standard  
theoretical models were shown to give very accurate  
predictions of actual observations for all cases except  
when the RF frequency was near the plasma frequency.  
Keywords: Earth atmosphere, Microwave transmission, Burst  
transmission, Breakdown electron threshold,  
Electromagnetic shielding, Microwave pulses, Large orbit  
gyrotrons, Plasmas physics, Air (EDC)

DESCRIPTORS: (U) BURST TRANSMISSION, MICROWAVES,  
ACCURACY, AIR, BREAKDOWN(ELECTRONIC THRESHOLD), EARTH  
ATMOSPHERE, ELECTROMAGNETIC SHIELDING, ELECTROMAGNETIC  
WAVE PROPAGATION, MICROWAVE FREQUENCY, GYROTRONS, HIGH  
POWER, IONIZATION, MEDIA, MICROWAVE EQUIPMENT, MICROWAVE  
TRANSMISSION, MATHEMATICAL MODELS, NEUTRAL, ORBITS,  
PLASMAS(PHYSICS), MATHEMATICAL PREDICTION, PULSES,  
RADIATION, RADIOFREQUENCY, RADIOFREQUENCY POWER, SOURCES,  
THEORY, X RAYS.

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AD-A208 657 10/4 20/9

BROWN UNIV PROVIDENCE RI LEFSCHETZ CENTER FOR DYNAMICAL SYSTEMS

APPLIED MICROWAVE PLASMA CONCEPTS CARLSBAD CA

(U) A Numerical Study of an Augmented Lagrangian Method for the Estimation of Parameters in Elliptic Systems.

(U) Efficient Energy Storage and Conversion Using Adiabatic Compression of Relativistic-Electron Plasmas.

DESCRIPTIVE NOTE: Final rept. for 15 May 86-31 Dec 88.

JAN 89 37P

JAN 89 34P

PERSONAL AUTHORS: Ito, K.; Kroller, M.; Kunisch, K.

PERSONAL AUTHORS: Guest, Gareth E.; Dandl, Raphael A.; Miller, Robert L.

CONTRACT NO. F49620-86-C-0111

PROJECT NO. 2304

REPORT NO. AMPC-028-036

TASK NO. 11

CONTRACT NO. F49620-86-C-0055

MONITOR: AFOSR  
TR-89-0697

PROJECT NO. 2301

TASK NO. A8

UNCLASSIFIED REPORT

MONITOR: AFOSR  
TR-89 0711

ABSTRACT: (U) A method based on an augmented Lagrangian formulation is developed which allows one to estimate coefficients in an elliptic differential equation from measurements of the state. This is a hybrid method combining the output-least-squares and the equation-error technique. Seminorm regularization is employed, and convergence and stability properties are discussed. Several aspects of an efficient implementation are described. Finally the effectiveness of the method is demonstrated by means of one and two dimensional examples. (KR)

DESCRIPTORS: (U) \*LAGRANGIAN FUNCTIONS, \*NUMERICAL ANALYSIS, AUGMENTATION, COEFFICIENTS, DIFFERENTIAL EQUATIONS, ELLIPSES, ESTIMATES, FORMULAS (MATHEMATICS), HYBRID SYSTEMS, PARAMETERS, STABILITY.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A1.

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UNCLASSIFIED REPORT

ABSTRACT: (U) The Plasma Electron Microwave Source (PEMS) concept in a relativistic-electron plasma confined in a magnetic-mirror device. The stored energy is transformed into microwave through amplification of whistler waves that can be launched externally for amplifier operation or generated spontaneously for oscillator operation. The anisotropy of the hot-electron temperature governs the maximum plasma energy density that can be stored, the amplification rates, and the saturated power level of the unstable whistler waves. This report summarizes the results of theoretical studies of (1) the critical aspects of hot electron plasmas generated by ECH techniques, such as the Upper-Orb-Resonant Heating pioneered by Dandl in the ELMO series of experiments; and (2) the spatial amplification rates of unstable whistler waves in these plasmas. It is shown that a substantial fraction of the energy stored in a hot-electron plasma can be transformed into repetitive pulses of microwave power by employing the PEMS approach, with typical values of gain, about 40db and bandwidth. (UHD)

DESCRIPTORS: (U) \*ENERGY STORAGE, \*MAGNETIC MIRRORS, \*PLASMA DEVICES, \*WHISTLERS, ADIABATIC CONDITIONS.



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AD-A208 656 6/3 6/15 6/1

AMPLIFICATION, AMPLIFIERS, ANISOTROPY, COMPRESSION,  
DENSITY, EFFICIENCY, ELECTRON ENERGY, GAIN, MICROWAVES,  
OSCILLATORS, PLASMAS(PHYSICS), POWER LEVELS,  
RADIOFREQUENCY POWER, SATURATION, SOURCES, SPATIAL  
DISTRIBUTION, TEMPERATURE, PLASMA WAVES.

OFEGON STATE UNIV CORVALLIS

(U) Evidence for Heterogeneity of Muscarinic Receptors in  
the Mollusc Pleurobranchaea.

DESCRIPTIVE NOTE: Rept. for 1 Oct 86-14 Jan 89,

IDENTIFIERS: (U) PEG1102F, WUAFOSR2301A8.

88 12P

PERSONAL AUTHORS: Murray, T. F.; Mpitso, G. J.

CONTRACT NO. AFOSR-86-0067

PROJECT NO. 2312

TASK NO. A1

MONITOR: AFOSR  
TR 89-0728

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Brain Research Bulletin, v21  
p181-190 1988.

ABSTRACT: (U) The properties of the specific binding of  
the muscarinic antagonist (Iodine 125I)-3-quinuclidinyl-4-  
iodobenzilate ((125I)4IQNB) to nervous tissue of  
Pleurobranchaea californica were characterized. The  
specific binding of (125I)4IQNB to Pleurobranchaea nervous  
tissue was characterized by its high affinity and  
saturation. A comparison of the numbers of binding  
sites recognized by (125I)4IQNB and 1-(Tritium)QNB in  
nervous tissue of three invertebrate species indicated  
that in Aplysia and Cancer magister (crab) ganglia  
membranes the two radioligands labeled comparable numbers  
of binding sites; however, in Pleurobranchaea membranes 1-  
(3H)QNB recognized only a subpopulation (8-10%) of the  
total number of (125I)4IQNB binding sites. The disparity  
in the numbers of binding sites labeled by these  
radioligands was consistent with our finding of a  
heterogeneity of muscarinic antagonist binding sites in 1-  
QNB competition experiments in Pleurobranchaea. Computer-  
assisted analysis of 1-QNB competition of (125I)4IQNB  
specific binding demonstrated that these data were best  
described by a two-site model with high- and low-affinity  
sites for 1-QNB. Reprints. (AW)

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DESCRIPTORS: (U) \*GANGLIA, \*GASTROPODA, \*PHARMACOLOGICAL  
ANTAGONISTS, APLYSIA, BINDERS, CRABS, HETEROGENEITY,  
INVERTEBRATES, MEMBRANES(BIOLOGY), MUSCARINE, NERVES,  
NUMBERS, POPULATION, RECEPTION, REPRINTS, TISSUES(BIOLOGY)  
NERVE BLOCKING, IODINE, RADIOACTIVE ISOTOPIES, LABELED  
SUBSTANCES, BENZENE COMPOUNDS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2312A1, \*Muscarinic  
antagonists, Iodine 125, Benzilate/3-quinuclidinyl-4-iodo,  
\*pleurobranchaea californica, \*Muscarinic receptors,  
\*Benzilates.

AD-A208 655 20/9 19/12

R AND D ASSOCIATES ALEXANDRIA VA WASHINGTON RESEARCH LAB  
(U) Dense Plasma Jet Propagation for Endoatmospheric  
Ballistic Missile Defense.

DESCRIPTIVE NOTE. Final rept. 1 Oct 86-30 Jun 88.

JUN 88 79P

CONTRACT NO. F49620-87-C-0008

PROJECT NO. D812

TASK NO. F1

MONITOR: AFOSR  
TR-89-0720

UNCLASSIFIED REPORT

ABSTRACT: (U) A variety of schemes have been proposed for delivering lethal amounts of energy and/or momentum to targets such as missiles and high speed aircraft. One class of technology involves the use of high speed plasmas. The primary attraction of such technology is the possibility of utilizing relatively compact accelerators and electrical power systems that could allow highly mobile and agile operation from rocket or aircraft platforms, or in special ordnance. This research has been developing the experimental conditions necessary to achieve reasonable comparison with theoretical predictions for plasma jet propagation in the atmosphere. Time-resolved measurements have been made of high speed argon plasma jets penetrating a helium background (simulating xenon jets propagating into air). Basic radial confinement of the jet has been observed by photography and spectroscopy and structures in the flow field resemble those predicted by numerical calculations. Results from our successful initial experiments have been used to design improved diagnostic procedures and arcjet source characteristics for further experiments. (EDC)

DESCRIPTORS: (U) \*DENSE GASES, \*PLASMA JETS, DIRECTED ENERGY WEAPONS, AIRCRAFT, ANTIMISSILE DEFENSE SYSTEMS, ARGON, BACKGROUND, COMPUTATIONS, CONFINEMENT(GENERAL), DIAGNOSIS(GENERAL), EARTH ATMOSPHERE, ELECTRIC POWER, ELECTRICAL EQUIPMENT, ENDOATMOSPHERE, FLOW FIELDS, GUIDED MISSILES, HELIUM, HIGH VELOCITY, MEASUREMENT, MOBILE.

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MOMENTUM, NUMERICAL ANALYSIS, PARTICLE ACCELERATORS,  
PHOTOGRAPHY, PLASMAS(PHYSICS), PREDICTIONS, PROPAGATION,  
SIMULATION, SPECTROSCOPY, TARGETS, THEORY, TIME, XENON.

CALIFORNIA INST OF TECH PASADENA ARTHUR AMOS NOYES LAB  
OF CHEMICAL PHYSICS

(U) Femtochemistry of the Reaction:  $\text{IHgI} + \text{Yields}$  (IHg...I)  
\* Yields  $\text{HgI} + \text{I}$ , .

IDENTIFIERS: (U) PE63220C, WUAFOSR0812F1.

MAR 89 9P

PERSONAL AUTHORS: Bowman, R. M.; Dantus, M.; Zevail, A. H.

CONTRACT NO. AFOSR-87-0071

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-89-0714

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Chemical Physics Letters,  
v156 n2-3 p131-137 1989.

ABSTRACT: (U) Femtochemistry of the reaction  $\text{IHgI}$  yields  
 $\text{IHg} + \text{I}$  yields  $\text{HgI} + \text{I}$  is reported. We observe femtosecond  
decays with an oscillatory modulation. These observations  
are related to the reaction trajectories on the global  
PES, which involve a symmetric stretch, an antisymmetric  
stretch and a bend. Keywords: Iodine compounds; Mercury  
compounds; Femtochemistry; Reaction dynamics; Real time;  
Dissociation; Dynamics; Vibrational; Rotational states;  
Reprints. (NJM)

DESCRIPTORS: (U) \*IODINE COMPOUNDS, \*MERCURY COMPOUNDS,  
\*REACTION KINETICS, DISSOCIATION, DYNAMICS, MODULATION,  
OSCILLATION, REAL TIME, REPRINTS, RESPONSE, TRAJECTORIES,  
YIELD, DECAY, MOLECULAR ROTATION, MOLECULAR VIBRATION,  
MOLECULAR STATES.

IDENTIFIERS: (U) \*Femtochemistry.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI32L

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OREGON STATE UNIV NEWPORT OR HATFIELD MARINE SCIENCE CENTER

AD-A208 642

CONTINUED

different chaotic attractors. Once the network learned one input, it could transmit another without changing the synapses. Reprints. (JHD)

(U) Connectionist Networks Learn to Transmit Chaos.

DESCRIPTIVE NOTE: Rept. for 10 Jan 86-14 Jan 89,

88

10P

DESCRIPTORS: (U) \*BIONICS, \*NERVOUS SYSTEM, \*NETWORKS, \*SYNAPSE, ALGORITHMS, ANALOG SYSTEMS, BIOLOGY, CIRCUITS, ERRORS, FEEDBACK, INPUT OUTPUT PROCESSING, LEARNING, MOTORS, NERVE CELLS, PATTERNS, REPRINTS, SIGNALS.

PERSONAL AUTHORS: Mpitsos, George J.; Burton, Robert M., Jr.; Creech, H. C.

IDENTIFIERS: (U) PE61102F, WUAFOSR2312A1, Rossler attractor, Chaos.

CONTRACT NO. AFOSR-86-0076

PROJECT NO. 2312

TASK NO. A1

MONITOR: AFOSR  
TR-89-0708

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Brain Research Bulletin, v21 p539-546 1988.

ABSTRACT: (U) The activity of some neurons during the generation of coordinated motor patterns may be attributable to chaos. Because even simple biological systems are difficult to control, connectionist networks are used to inquire into the question of whether a chaotic signal originating in one part of the nervous system can be learned and transmitted by another. A number of different architectures are examined, and the findings reported for a simple network consisting of one input unit, four hidden units, and one output unit. During training sessions, the input of the circuit was given analog values of either the 3.60 or 3.95 logistic equation, or of one variable of the three-variable Rossler attractor. The backpropagated error in the learning algorithm was a function of the difference between the input value and the output at each iteration. Iterations involving small changes in analog value resulted in good similarity between the input and output signals, but little learning occurred because of the small error propagated back to the synapses. With larger differences in the analog values (and larger feedback error) at each iteration, networks learned to transmit

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EV132L

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CALIFORNIA INST OF TECH PASADENA DEPT OF APPLIED MATHEMATICS

OREGON STATE UNIV CORVALLIS

(U) Muscarinic Antagonist Enhances One-Trial Food-Aversion Learning in the Mollusc Pleurobranchaea.

DESCRIPTIVE NOTE: Final rept..

DESCRIPTIVE NOTE: Rept. for 1 Oct 86-14 Jan 89.

MAY 89

6P

MAR 89

14P

PERSONAL AUTHORS: Cohen, Donald S.

PERSONAL AUTHORS: Mpitsos, George J.; Murray, Thomas F.; Creech, H. C.; Barker, David L.

CONTRACT NO. AFOSR-87-0270

CONTRACT NO. AFOSR-86-0076

PROJECT NO. 2304

PROJECT NO. 2312

TASK NO. A4

TASK NO. A1

MONITOR: AFOSR

TR-89-0703

MONITOR: AFOSR

TR-89-0706

UNCLASSIFIED REPORT

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ABSTRACT: (U) Recent advances in materials science and synthetic chemistry have led to the development and design of new classes of polymeric materials with desirable and beneficial properties. These are of enormous importance in many industrial and military situations. Most of these materials have features not well understood scientifically and not explainable with current standard equations of motion. The authors looked at several classes of these polymers with the intent of developing the nonlinear models for the study of transport by and through them. The models are then applied to specific new technological problems necessitating the development of new asymptotic, perturbation and numerical techniques for their solutions. (KR)

DESCRIPTORS: (U) \*CONTINUUM MECHANICS, \*DIFFERENTIAL EQUATIONS, \*POLYMERS, INDUSTRIES, MATERIALS, MATHEMATICAL MODELS, NONLINEAR SYSTEMS, NUMERICAL METHODS AND PROCEDURES, SYNTHESIS(CHEMISTRY), TRANSPORT.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2304A4.

SUPPLEMENTARY NOTE: Pub. in Brain Research Bulletin, v21 p169-179 1988.

ABSTRACT: (U) One hour before training, in two replicate studies on the sea slug Pleurobranchaea californica, all animals (N=114) received body-cavity injections of scopolamine, oxotremorine, or the equivalent volume of the saline/seawater vehicle that was used to inject the drugs. The low drug doses (2 micromoles/kg) were near the threshold for generating observable neurophysiological responses, but did not affect feeding thresholds arising to a stimulus derived from beer (Sbr) and to one derived from squid (Ssq). By comparison to the other injection, scopolamine 1) increased the ability of the experimental animals to make the discrimination between Sbr and Ssq, and 2) prevented learning to avoid Sbr in the control animals. An accompanying paper provides a detailed characterization of muscarinic receptor pharmacology in Pleurobranchaea. Keywords: Muscarinic antagonist, Food-aversion, Mollusc, Electric shocks, Learning, Reprints. (KT)

DESCRIPTORS: (U) \*CONDITIONING(LEARNING), \*PHARMACOLOGICAL ANTAGONISTS, \*AVOIDANCE, CONTROL, DOSE RATE, DRUGS, GASTROPODA, LABORATORY ANIMALS, LOW RATE, (KT)

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SEARCH CONTROL NO. EV132L

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MUSCARINE, NEUROPHYSIOLOGY, PHARMACOLOGY, RECEPTION, REPRINTS, RESPONSE(BIOLOGY), SALINITY, SEA WATER, VOLUME, FOOD BEVERAGES, STIMULI, CONDITIONED RESPONSE.

IDENTIFIERS: (U) PE61102F, WJAFOSR2312A1, Pleurobranchaea californica, Sea slugs, Oxotremorine, Muscarinic antagonists, Muscarinic receptors, Electric shocks, Beer.

AD-A208 635

13/13

GEORGETOWN UNIV WASHINGTON D C

(U) Studies in Stabilization and Control of Beams and Plates.

DESCRIPTIVE NOTE: Final rept. 1 Jun 86-31 Aug 88.

AUG 88

3P

PERSONAL AUTHORS: Lagnese, John E.

CONTRACT NO. AFOSR-86-0162

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-89-0726

UNCLASSIFIED REPORT

ABSTRACT: (U) The principal achievement of the research undertaken under this grant was the development of comprehensive theories of exact controllability and stabilization of thin plate dynamics by means of forces and moments applied on the edge of the plate, based on continuum models of plates. Two major research monographs, which lay the foundations of the theories, were written. The motivation for this study, and its ultimate goal, is the design and analysis of practical strategies for active control and vibration suppression in flexible structures. A second, related, area of research was the design of feedback controls acting on the edge of the plate which uniformly stabilize plate motion, i.e. which cause all of the modes to decay at some uniform rate. Once again, such control strategies were sought for a wide variety of plate models, including nonlinear models. In fact, our results for nonlinear models (in which the nonlinearities may be both in the dynamics and in the feedback control) are probably the first of their kind. Structural beams, Thermal stresses. (JES)

DESCRIPTORS: (U) BEAMS(STRUCTURAL), CONTROL, DOCUMENTS, DYNAMICS, FEEDBACK, FLEXIBLE STRUCTURES, FOUNDATIONS(STRUCTURES), MATHEMATICAL MODELS, MODELS, MOMENTS, MOTIVATION, NONLINEAR SYSTEMS, RATES, STRATEGY, SUPPRESSION, THEORY, THERMAL STRESSES, VIBRATION.

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PRINCETON UNIV NJ

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A1.

(U) Markov Processes Applied to Control, Reliability and Replacement.

DESCRIPTIVE NO E: Final rept. Oct 87-Sep 88.

APR 99 5P

PERSONAL AUTHORS: Cinlar, E.

CONTRACT NO. AFOSR-87-0050

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR 89-0700

UNCLASSIFIED REPORT

ABSTRACT: (U) This reports on the work done on stochastic comparisons of semimartingale Markov processes, opportunistic replacement policies, stochastic flows, and the book project on probability theory and stochastic processes. Keywords: Stochastic flows; Random variables; Hunt processes. (KR)

DESCRIPTORS: (U) MARKOV PROCESSES, FLOW, POLICIES, PROBABILITY, RANDOM VARIABLES, RELIABILITY, REPLACEMENT, REPORTS, STOCHASTIC PROCESSES, THEORY.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A5.

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## DTIC REPORT BIBLIOGRAPHY

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IOWA STATE UNIV AMES DEPT OF MATHEMATICS

HYPRES INC ELMSTORD NY

- (U) Analysis and Numerical Analysis of Some Properly and Improperly Posed Problems in Applied Mathematics.

- (U) MM - Wave Components - SIS (Superconductor-Insulator-Superconductor) Mixers.

DESCRIPTIVE NOTE: Final rept. 15 Oct 87-14 Oct 88.

DESCRIPTIVE NOTE: \*Final rept. Nov 86-Dec 88.

OCT 88 18P

89 50P

PERSONAL AUTHORS: Levine, Howard A.

PERSONAL AUTHORS: Whiteley, S. R.

PROJECT NO. 2304

CONTRACT NO. F49620-87-C-0014

TASK NO. A9

PROJECT NO. 3005

MONITOR: AFOSR

TASK NO. A1

TR 89-0702

MONITOR: AFOSR

TR-89 0620

UNCLASSIFIED REPORT

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ABSTRACT: (U) We proposed to study several different types of problems involving partial differential equations which arise naturally in applications. Qualitative behavior of solutions of nonlinear evolution equations; and parameter identification problems. (KR)

ABSTRACT: (U) Superconductor-Insulator-Superconductor (SIS) tunnel junction mixers are known to provide ultra-high sensitivity receiver applications above 30 GHz. In this two year (Phase II) program, HYPRES, in collaboration with the National Radio Astronomy Observatory, have developed novel fully integrated SIS mixer circuits, and demonstrated a unique high efficiency cooling system. The integrated SIS mixer chip contains, aside from the actual mixer elements, passive tuning components, an IF filter, a coplanar transmission line, and a waveguide coupler, necessary components heretofore realized off chip. Fabrication of the integrated mixer required development of a nine level process and optimization of the process dependent electrical parameters of the SIS devices. The device performs efficiently in the range of 75-115 GHz. A novel dewar-based cooler, which makes use of the extremely low thermal conductivity of the fused silica chip substrate to achieve an incremental thermal load of 25 mW, was fabricated and demonstrated. Such a cryostat allows relatively long term unattended operation of SIS, or other, cryogenic devices. (rh)

DESCRIPTORS: (U) \*APPLIED MATHEMATICS, \*PARTIAL DIFFERENTIAL EQUATIONS, BEHAVIOR, EVOLUTION(GENERAL), IDENTIFICATION, NONLINEAR ALGEBRAIC EQUATIONS, NUMERICAL ANALYSIS, PARAMETERS, PROBLEM SOLVING.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A9.

DESCRIPTORS: (U) \*CHIPS(ELECTRONICS), \*MIXERS(ELECTRONICS), \*WAVEGUIDE COUPLERS, ASTRONOMICAL OBSERVATORIES, COOLING AND VENTILATING EQUIPMENT.

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CRYOGENICS, CRYOSTATS, EFFICIENCY, ELECTRICAL PROPERTIES,  
FUSED SILICA, HIGH RATE, LOW LEVEL, OPERATION,  
OPTIMIZATION, PARAMETERS, PASSIVE SYSTEMS, PLANAR  
STRUCTURES, RADIO ASTRONOMY, SUBSTRATES, THERMAL  
CONDUCTIVITY, THERMAL PROPERTIES, TRANSMISSION LINES,  
TUNING, WAVES.

CARNEGIE-MELLON UNIV PITTSBURGH PA

(U) Non-Linear Dynamics and Chaotic Motions in Feedback  
Controlled Elastic System.

DESCRIPTIVE NOTE: Final rept. 1 Dec 83-30 Sep 88.

IDENTIFIERS: (U) PE61102F, WUAFOSR3005A1, HYPRESS  
proprietary.

88 9P

CONTRACT NO. AFOSR-84-0051

PROJECT NO. 2304

TASK NO. A4

MONITOR: AFOSR  
TR-89-0725

UNCLASSIFIED REPORT

ABSTRACT: (U) J. Guckenheimer, D. Armbruster (postdoc)  
and S. Campbell (grad student) and I have continued our  
work on the global dynamics and bifurcations of O(2)  
symmetric ODEs. Such systems are obtained as finite  
dimensional projections or reductions of spatially  
translation- and reflection-invariant PDE S, for example.  
In 1987/88, partially supported by this grant, we  
provided a complete analysis of heteroclinic cycles and  
modulated travelling waves in two mode (K:2K) interacting  
systems. In particular, we pointed out that heteroclinic  
cycles are structurally stable features in such systems.  
(MJM)

DESCRIPTORS: (U) \*CONTROL SYSTEMS, \*TRAVELING WAVES,  
DYNAMICS, ELASTIC PROPERTIES, FEEDBACK, GLOBAL,  
INTERACTIONS, MODULATION, NONLINEAR SYSTEMS,  
SIZES(DIMENSIONS).

IDENTIFIERS: (U) WUAFOSR2304A4, PE61102F.

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CARNEGIE MELLON UNIV PITTSBURGH PA

NEW MEXICO UNIV ALBUQUERQUE

(U) Singular and Bang-Bang Stochastic Control.

(U) Operation and Upgrading of the Beam Optics Test Stand.

DESCRIPTIVE NOTE: Final rept. 30 Sep 85-30 Sep 88.

DESCRIPTIVE NOTE: Final rept. 1 Nov 85-31 Mar 88.

88 5P

FEB 89 87P

PERSONAL AUTHORS: Shreve, Steven E.

PERSONAL AUTHORS: Humphries, S., Jr

CONTRACT NO. AFOSR-85-0360

CONTRACT NO. AFOSR-86-0063

PROJECT NO. 2304

PROJECT NO. 2301

TASK NO. A1

TASK NO. A7

MONITOR: AFOSR  
TR-89-0724MONITOR: AFOSR  
TR-89-0707

## UNCLASSIFIED REPORT

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ABSTRACT: (U) The proposal which formed the basis for this grant consisted of three parts: research on singular stochastic control, research on bang-band stochastic control, and the creation of a graduate text which would make these two topics widely accessible. Significant progress has been made in the two research areas, although a number of important questions remain. The proposed graduate text has been completed and a copy was provided to the Air Force Office of Scientific Research in December 1987. We discuss each of these three topics in turn. (KR)

ABSTRACT: (U) This grant studied novel methods to focus high intensity neutral particle beams. The work directly impacts the space based neutral particle beam program. The goal was to investigate methods to correct aberrations in the final focusing lens of an NPB accelerator. The two unconventional beam optics techniques that were developed and investigated were: 1) biased grid arrays to correct particle orbits and 2) solenoid lenses with entrapped non-neutral electron distributions to correct spherical aberration.

DESCRIPTORS: (U) \*STOCHASTIC CONTROL, PULSE MODULATION, AIR FORCE RESEARCH.

DESCRIPTORS: (U) \*OPTICS, \*TEST STANDS, ARRAYS, BIAS, DISTRIBUTION, ELECTRONS, FOCUSING, GRIDS, LENSES, ORBITS, PARTICLES, SOLENOIDS.

IDENTIFIERS: (U) WUAFOSR2304A1, PE61102F.

IDENTIFIERS: (U) WUAFOSR2301A7, PE61102F.

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OTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. E/132L

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OREGON STATE UNIV NEWPORT OR HATFIELD MARINE SCIENCE CENTER

TRANSMISSION, CIRCADIAN RHYTHMS, DYNAMICS, FREQUENCY, INTERPOLATION, MOTOR REACTIONS, MOLLUSCA, NERVE CELLS, NEURAL NETS, NEUROCHEMISTRY, PARALLEL PROCESSING, PATTERNS, REPRINTS, SPIKES, WIDTH.

(U) Evidence for Chaos in Spike Trains of Neurons That Generate Rhythmic Motor Patterns.

IDENTIFIERS: (U) PE61102F, WUAFOSR2312A1.

DESCRIPTIVE NOTE: Rept. for 10 Jan 86-14 Jan 89.

88 12P

PERSONAL AUTHORS: Mpitso, George J.; Burton, Robert M., Jr.; Creech, H. C.; Soinila, Seppo O.

CONTRACT NO. AFOSR-86-0076

PROJECT NO. 2312

TASK NO. A1

MONITOR: AFOSR  
TR 89-0709

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Brain Research Bulletin, v21 p529-538 1988.

ABSTRACT: (U) The findings presented here of work on the opisthobranch mollusc *Pleurobranchaea californica* indicate that some of the variability that has been observed in the activity of neurons during patterned motor activity may be attributable to low-dimensional chaos. We obtained long trains of action potentials (spikes) from these neurons, scanned them using adjacent temporal windows having equal widths, and converted the counts into frequency times series. The present findings are similar to those of previous work in which equal-interval time series were obtained by interpolation of the unequal interval spike trains. We discuss the implications of chaos and the difficulties in the application of extant dynamical tools to spike trains. An accompanying paper inquires into the ability of neural networks to read and transmit chaotic activity. Keywords: Chaos; fractals; Mollusc; Motor systems; Parallel processing; Self organization; Neurochemistry; Nerve transmission; Nerve impulses; Reprints. (KT)

DESCRIPTORS: (U) \*MOTOR NEURONS, \*NERVE IMPULSES, \*NERVE

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI32L

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AD-A208 624 CONTINUED

LEHIGH UNIV BETHLEHEM PA

(U) Three-Dimensional Vortex Interactions in Turbulent Boundary Layers.

IDENTIFIERS: (U) Hairpin vortices, PE81102F,  
WUAFOSR2307A2.

DESCRIPTIVE NOTE: Final rept. 7 Jan 85-30 Nov 88.

APR 89 73P

PERSONAL AUTHORS: Smith, C. R.; Walker, J. D.

CONTRACT NO. F49620-85-C-0108

PROJECT NO. 2307

TASK NO. A2

MONITOR: AFOSR  
TR-89-0689

UNCLASSIFIED REPORT

ABSTRACT: (U) The results and accomplishments of a combined analytical-experimental research program, aimed at understanding and modeling the three-dimensional vortex interactions that take place in turbulent boundary layers, are described. The central theme of the program is that hairpin vortices are the basic building block of boundary-layer turbulence and that many of the observed dynamic features of turbulent shear flows can be explained in terms of how hairpin vortices interact with the background shear, with each other and the viscous flow near solid walls. A basic intent of the program is to cross-compare detailed experimental flow visualization-imaging studies of well-defined three-dimensional hairpin vortices with computational studies of the behavior, evolution and induced effects of comparable vortices. Based on these investigations, a model of the dynamics of turbulent flows near a wall is proposed. Keywords: Turbulent boundary layer, Coherent structure, Vortex interactions, Hairpin vortices, Turbulence modeling. (EDC)

DESCRIPTORS: (U) THREE DIMENSIONAL FLOW, TURBULENT BOUNDARY LAYER, VORTICES, BACKGROUND, BOUNDARY LAYER, COHERENCE, COMPUTATIONS, DYNAMICS, FLOW VISUALIZATION, INTERACTIONS, MODELS, MODULAR CONSTRUCTION, OPTICAL IMAGES, SHEAR PROPERTIES, THREE DIMENSIONAL, TURBULENCE, TURBULENT FLOW, VISCOUS FLOW, WALLS.

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UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES DEPT OF ELECTRICAL ENGINEERING

BROWN UNIV PROVIDENCE RI DIV OF APPLIED MATHEMATICS

(U) Fast Digital Correlations and Transforms Using Finite Field Techniques.

(U) An Averaging Method for Stochastic Approximations with Constant Parameters: Small Parameter Values.

MAR 80 26P

DESCRIPTIVE NOTE: Final progress rept.

PERSONAL AUTHORS: Kushner, H. J.

DEC 79 9P

PERSONAL AUTHORS: Reed, I. S.

CONTRACT NO. AFOSR-76-3063

CONTRACT NO. AFOSR-75-2798

PROJECT NO. 2304

PROJECT NO. 2304

TASK NO. A1

TASK NO. A6

MONITOR: AFOSR

TR-89-0744

MONITOR:

UNCLASSIFIED REPORT

TR-89-0745

UNCLASSIFIED REPORT

ABSTRACT: (U) This research was principally in the following four areas--Finite fields in digital signal processing, transform decoders for correcting both errors and erasures of the Reed-Solomon code, xray 3-d reconstruction, and a fast two dimensional convolution by the polynomial transform. Keywords: Fast Fourier transforms, Recursive filters. (KR)

DESCRIPTORS: (U) \*FAST FOURIER TRANSFORMS, \*CORRELATION TECHNIQUES, CONVOLUTION, CORRELATION, DIGITAL SYSTEMS, HIGH RATE, RECURSIVE FILTERS, SIGNAL PROCESSING, TWO DIMENSIONAL, POLYNOMIALS, THREE DIMENSIONAL.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A6.

ABSTRACT: (U) Stochastic approximations with constant gain coefficients and dependent noise and nonlinear or even discontinuous dynamics have many applications in control, automata and communication theory. When the gain coefficient is small, an asymptotic theory is developed which gives much information on the character of the paths and errors. The method involves both averaging and stability ideas. The ideas are outlined. An example which illustrates the basic ideas and techniques is given. (KR)

DESCRIPTORS: (U) \*NUMERICAL METHODS AND PROCEDURES, \*STOCHASTIC PROCESSES, \*APPROXIMATION(MATHEMATICS), ASYMPTOTIC SERIES, AUTOMATA, COEFFICIENTS, DYNAMICS, GAIN, INFORMATION THEORY, NOISE, PARAMETERS, STOCHASTIC PROCESSES.

IDENTIFIERS: (U) WUAFOSR2304A1, PE61102F.

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AD A208 618 9/1 12/3

AD-A208 613 20/3 12/5 23/3

CALIFORNIA UNIV IRVINE

PURDUE UNIV LAFAYETTE IN SCHOOL OF ELECTRICAL ENGINEERING

(U) Statistical Analysis of the LMS and Modified Stochastic Gradient Algorithms.

(U) Expert Systems for the Scheduling of Image Processing Tasks on a Parallel Processing System.

DESCRIPTIVE NOTE: Annual rept. 15 May 88-14 May 89.

DESCRIPTIVE NOTE: Final rept..

MAY 89 23P

DEC 86 77P

PERSONAL AUTHORS: Bershad, Neil J.

PERSONAL AUTHORS: Well, Francis J.

CONTRACT NO. AFOSR-86-0093

CONTRACT NO. F49620-86-K-0006

PROJECT NO. 2304

MONITOR: AFOSR  
TR-89-0731

TASK NO. A6

MONITOR: AFOSR  
TR-89-0701

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) During the period April 15 1989, the Air Force Office of Scientific Research supported research work on the stochastic behavior of the LMS and related adaptive algorithms has yielded results in two major areas: Digital Implementation of Stochastic Gradient Type adaptive Algorithms; and LMS and RLS Performance Comparison for Tracking a Chirped Sinusoid in Noise. Keywords: Mathematical models, Electrical engineering, Echo cancellation, Abstracts. (KR)

DESCRIPTORS: (U) \*ALGORITHMS, \*STATISTICAL ANALYSTS, ADAPTIVE SYSTEMS, ABSTRACTS, CANCELLATION, COMPARISON, ECHOES, ELECTRICAL ENGINEERING, GRADIENTS, MATHEMATICAL MODELS, STOCHASTIC PROCESSES, TRACKING.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2304A6.

ABSTRACT: (U) The algorithms used in image processing are becoming longer and more complex as researchers strive to create vision systems whose performance rivals that of the human's. The size and complexity of these algorithms, however, generally do not allow them to be run in 'real time' on any sequential (Von Neumann) machine. Image processing algorithms tend to be highly parallel in nature. One can hope, therefore, that the recent advances in parallel computing will bring significant speed-ups in the execution times of image processing algorithms. However, it is usually the case that image processing systems are extremely computationally intensive. Even with speed-ups brought about by parallel computers, there is a demand for an advisory system that optimizes the execution time of image processing algorithms. A reasonable goal for such a system is as follows. Given a list of all the subtasks that need to be run for a given image processing task, produce an initial schedule and configuration and then adjust the schedule and configuration during runtime based on the current configuration and intermediate processing results. The proposed work will proceed towards this goal on several fronts. Theses. (RH)

DESCRIPTORS: (U) \*ALGORITHMS, \*COMPUTERS, \*IMAGE PROCESSING, \*PARALLEL PROCESSING, \*VISION, ADVISORY ACTIVITIES, CONFIGURATIONS, HUMANS, PARALLEL ORIENTATION, PROCESSING, REAL TIME, SCHEDULING, THESES, TIME.

IDENTIFIERS: (U) PEG1102F.

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AD-A208 589 7/4 8/10

COLUMBIA UNIV NEW YORK DEPT OF MATHEMATICS

NEW JERSEY INST OF TECH NEWARK

(U) Differential Equations, Related Problems of Pade Approximations and Computer Applications.

(U) Plastic Deformation of Granular Materials.

DESCRIPTIVE NOTE: Final rept. 1 Jan 87-31 Dec 88.

DESCRIPTIVE NOTE: Final rept. 1 Apr 88-31 Mar 89.

88

62P

MAR 89 11P

PERSONAL AUTHORS: Chudnovsky, D. V.; Chudnovsky, G. V.

PERSONAL AUTHORS: Pitman, E. B.

CONTRACT NO. AFOSR-87-0117

CONTRACT NO. AFOSR-88-0182

PROJECT NO. 2304

PROJECT NO. 2304

TASK NO. A4

TASK NO. A4

MONITOR: AFOSR

MONITOR: AFOSR

TR-89-0729

TR-89-0723

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) During the past period of the Grant, this work focused on the study of analytic, arithmetic and algorithmic properties of differential equations applied to solutions of problems in theoretical mathematics, mathematical and theoretical physics, numerical methods and computer science. Keywords: Graphs, Polynomials, Fractions. (KR)

DESCRIPTORS: (U) DIFFERENTIAL EQUATIONS, ALGORITHMS, APPROXIMATION(MATHEMATICS), COMPUTER APPLICATIONS, COMPUTERS, GRAPHS, MATHEMATICS, NUMERICAL METHODS AND PROCEDURES, PHYSICS, POLYNOMIALS.

IDENTIFIERS: (U) WUAFOSR2304A4, PE61102F.

DESCRIPTORS: (U) GRANULES, PLASTIC DEFORMATION, SOIL DYNAMICS, SOIL MECHANICS, CLAY, DEFORMATION, EVOLUTION(GENERAL), MATHEMATICAL MODELS, MODELS, SOILS, THEORY.

IDENTIFIERS: (U) WUAFOSR2304A4, PE61102F.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI32L

AD A208 588 6/11

WRIGHT STATE UNIV DAYTON OHIO DEPT OF CHEMISTRY

(U) A Study of the Nephrotoxicity and Metabolism of  
Tetralin and Indan in Fischer 344 Rats.

DESCRIPTIVE NOTE: Final technical rept. 1 Feb 87-30 Apr  
89.

MAY 89 89P

PERSONAL AUTHORS: Serve, M. P.

CONTRACT NO. AFOSR-87-0108

PROJECT NO. 2312

TASK NO. A5

MONITOR: AFOSR  
TR-89-0771

UNCLASSIFIED REPORT

ABSTRACT: (U) Certain hydrocarbons, both acyclic and cyclic, have been shown to induce a nephrotoxic effect in male rats. There is a strong feeling that the renal damage may be related to the metabolic handling of the hydrocarbon by the animals. Both cis- and trans-decalin as well as other saturated cyclic molecules have shown a proclivity of inducing the nephrotoxicity. Tetralin and indan, because of the aromatic ring which exists as part of their structures, introduces a structural difference when compared to other cyclic hydrocarbons which have produced the hyaline droplet nephrotoxicity. Male and female Fischer 344 rats were dosed intragastrically with tetralin or indan on an every other day regimen for 14 days. When compared with male control rats dosed with water, the male rat exposed to tetralin and indan exhibited increased cytoplasmic hyaline droplets in proximal convoluted tubular epithelial cells, which were indicative of toxic injury. Additionally, foci of cellular degeneration were present within proximal convoluted tubules. Exposed and control female Fischer 344 rats did not display any renal damage. Keywords: Nephrotoxicity; Cyclic compounds. (M)

DESCRIPTORS: (U) \*HYDROCARBONS, \*KIDNEYS, ANIMALS,  
AROMATIC COMPOUNDS, CONTROL, CYCLES, CYCLIC COMPOUNDS,

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DAMAGE, EXPOSURE (HYDROCARBONS), FEMALES, HANDLING, MALES,  
METABOLISM, MOLECULES, RATS, RINGS, SATURATION, TOXICITY,  
WATER.

IDENTIFIERS: (U) WUAFOSR2312AS, PE61102F, \*Cyclic  
hydrocarbons, \*Acyclic hydrocarbons, \*Nephrotoxins,  
\*Nephrotoxicity.



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AD-A208 587 CONTINUED

YALE UNIV NEW HAVEN CT DEPT OF PSYCHOLOGY

MUSIC, PATTERN RECOGNITION, PERCEPTION, PHONEMES,  
PROCESSING, RATES, SIGNALS.

(U) Levels of Processing of Speech and Non-Speech.

IDENTIFIERS: (U) PE61102F, WUAFOSR2313AG.

DESCRIPTIVE NOTE: Annual technical rept. Mar 88-Mar 89,

APR 89 17P

PERSONAL AUTHORS: Samuel, Arthur G.

CONTRACT NO. AFOSR-86-0357

PROJECT NO. 2313

TASK NO. A6

MONITOR: AFOSR  
TR-89-0770

UNCLASSIFIED REPORT

ABSTRACT: (U) The studies conducted examine both signal-dependent factors, and listener-dependent factors. The examinations of signal factors include experiments on perceptual degradation due to signal interruption at critical rates (approximately 4cps), and studies mapping the early levels of representation of speech. The data support the existence of two qualitatively different early processing stages; the first is relatively peripheral and subject to neural fatigue, while the second is central and subject to criterion shifts. The studies of listener-based factors include studies of perceptual restoration of deleted sounds (phonemes or musical notes), and studies of the perceptual effect of attentional allocation. The restoration experiments indicate similar architectures in the perceptual processing of speech and music. The attentional investigations demonstrate rather fine-tuned attentional control under high predictability conditions. Significant progress has been made in achieving the research objective of clarifying the properties of complex auditory pattern recognition. Keywords: Auditory signals/perception degradation, hearing speech/music, information processing (EDC)

DESCRIPTORS: (U) \*AUDITORY PERCEPTION, \*AUDITORY SIGNALS, \*INFORMATION PROCESSING, \*NERVOUS SYSTEM, \*SPEECH, DEGRADATION, FATIGUE, HEARING, INTERRUPTION, MAPPING.

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AD-A208 578 CONTINUED

BROWN UNIV PROVIDENCE RI LEFSCHETZ CENTER FOR DYNAMICAL SYSTEMS

IDENTIFIERS: (U) PEG1102F, WUAFOSR2304A1.

(U) Functional Occupation Measures and Ergodic Cost Problems for Singularly Perturbed Stochastic Systems.

APR 89 24P

PERSONAL AUTHORS: Kushner, Harold J.

REPORT NO. LCDS/CCS-89-6

CONTRACT NO. AFOSR-89-0015

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-89-0696

UNCLASSIFIED REPORT

Availability: Document partially illegible.

ABSTRACT: (U) Functional occupation measures are an extension to occupation measures on the path space of the usual definition of occupation measures for stochastic processes. They are used to get limit and approximation theorems for average cost per unit time problems for many types of controlled or uncontrolled random processes. This paper deals with diffusions reflected diffusions, and singularly perturbed controlled diffusions. There are extensions to wide bandwidth noise driven systems and to many other models. The method provides a convenient and powerful way of characterizing the processes associated with the weak limits of the occupation measures and with the sample limits of the average costs per unit time, as the various parameters of the problem go to their limits. The method can be used to get approximate optimality theorems and similar results for processes which are only approximated by jump diffusions and are of interest over a long time period. (KR)

DESCRIPTORS: (U) STOCHASTIC PROCESSES, CONTROL, COSTS, ERGODIC PROCESSES, LIMITATIONS, LONG RANGE(TIME), PERTURBATIONS, THEOREMS, TIME, DIFFUSION.

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SRI INTERNATIONAL MENLO PARK CA

(U) Multiphoton Detection Techniques for F and F2.

DESCRIPTIVE NOTE: Annual technical rept. Apr 88-Mar 89.

APR 89 17P

PERSONAL AUTHORS: Faris, G. W.; Dyer, M. J.; Huestis, D. L.

REPORT NO. SRI-MP-89-106

CONTRACT NO. F49620-88-K-0003

PROJECT NO. 2308

TASK NO. A3

MONITOR: AFOSR  
TR 89-0712

UNCLASSIFIED REPORT

ABSTRACT: (U) During the last year we have been performing experiments that will lead to the development of quantitative remote diagnostics for atomic and molecular fluorine, using ultraviolet multiphoton excitation followed by the detection of fluorescence or ionization. This report, describes the first demonstration of resonant multiphoton excitation of molecular fluorine and the construction of a new apparatus for high-sensitivity detection of atomic fluorine using two-photon absorption of 170 nm radiation from a narrow-band tunable ArF laser. Raman shifted in liquid nitrogen cooled HD. Keywords: Multiphoton excitation spectroscopy; Atomic fluorine, Molecular fluorine; Laser diagnostics. (jhd)

DESCRIPTORS: (U) \*MOLECULAR SPECTROSCOPY, \*FLUORINE, \*ATOMIC SPECTROSCOPY, \*TWO PHOTON ABSORPTION, DETECTION, DIAGNOSIS(GENERAL), EXCITATION, FLUORESCENCE, HIGH SENSITIVITY, IONIZATION, LASER APPLICATIONS, LASERS, MOLECULES, PHOTONS, RESONANCE RADIATION, ULTRAVIOLET RADIATION.

IDENTIFIERS: (U) \*Multiphoton excitation.

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PENNSYLVANIA STATE UNIV UNIVERSITY PARK DEPT OF METEOROLOGY

(U) A Numerical Investigation of a Convectively Generated, Inertially Stable, Extratropical Warm-Core Mesovortex Over Land Part 1. Structure and Evolution.

DEC 88 50P

PERSONAL AUTHORS: Zhang, Da-Lin; Fritsch, J. M.

CONTRACT NO. AFOSR-88-0050

PROJECT NO. 2310

TASK NO. A1

MONITOR: AFOSR  
TR-89-0603

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Monthly Weather Review, v116 n12 p2661-2687 Dec 88.

ABSTRACT: (U) A 36-h nested-grid numerical simulation of the life cycle of a convectively generated, inertially stable, warm core mesovortex is presented. The vortex evolved from a mesoscale convective complex that developed from a squall line over Oklahoma during 7-8 July 1982. A modified version of the mesoscale hydrostatic model with a fine-mesh grid resolution of 25 km is utilized for this study. The model simultaneously incorporates parameterized convection and a grid-resolved convective scheme containing the effects of hydrostatic water loading, condensation (evaporation), freezing (melting) and sublimation. Genesis, intensification and maintenance of a low- to mid-tropospheric closed meso-8 scale cyclone as well as the associated surface pressure perturbations, the evolution of moist convection, and the distribution and magnitude of total rainfall are simulated by the model. It is found that a propagating mesoscale vorticity disturbance, preexisting low-level frontal forcing and a convectively favorable environment ahead of the front help generate an organized area of upward motion wherein the vortex develops. However, it is the resolvable-scale latent heat release that appears to be directly responsible for producing the rotating MCS.

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Keywords: Reprints. (JHD)

PENNSYLVANIA STATE UNIV UNIVERSITY PARK DEPT OF METEOROLOGY

DESCRIPTORS: (U) \*CONVECTION(ATMOSPHERIC), \*THUNDERSTORMS, \*VORTICES, CONDENSATION, EVAPORATION, EVOLUTION(GENERAL), GRIDS, HYDROSTATIC PRESSURE, LAND AREAS, LIFE CYCLES, LOADS(FORCES), MESH, MOISTURE, HEAT OF VAPORIZATION, NUMERICAL ANALYSIS, OKLAHOMA, PERTURBATIONS, PRESSURE, RAINFALL, ATM, OSMOSPHERE MODELS, REPRINTS, RESOLUTION, SUBLIMATION, DIGITAL SIMULATION, SURFACE PROPERTIES, WATER, LATENT HEAT.

(U) Numerical Simulation of the Meso-Beta Scale Structure and Evolution of the 1977 Johnstown Flood. Part 3. Internal Gravity Waves and Squall Line.

APR 88 19P

PERSONAL AUTHORS: Zhang, Da-Lin; Fritsch, J. M.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2310A1, MCS(Mesoscale Convective System), Mesovortex, Squall lines.

CONTRACT NO. AFOSR-88-0050

PROJECT NO. 2310

TASK NO. A1

MONITOR: AFOSR  
TR-89-0602

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. In Jnl. of Atmospheric Science, v45 n7 p1251-1268, 1 Apr 88.

ABSTRACT: (U) The interaction between internal gravity waves and a squall line that developed early in the evolution of the 1977 Johnstown flood event is studied based on available surface observations and a three-dimensional model simulation of the flood-related mesoscale convective systems (MCSs). Several experimental simulations are carried out to investigate the mechanisms whereby gravity waves form and obtain energy. Both observations and model simulations of the wave/convection interaction fit certain theories of gravity wave propagation. Following the formation of the squall line, subsequent deep convection typically initiates behind a pressure trough associated with the line and ahead of or along the axis of the trailing ridge. The zero contours of vertical motion correspond closely to the axis of the surface pressure trough. Positive potential temperature perturbations correspond with descending motion occurring ahead of the trough while negative perturbations occur with increasing ascending motion towards the approaching ridge axis. The results indicate that physical interaction between deep convection and internal gravity waves can be simulated by numerical models if a compatible grid resolution, proper model physics and good

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Initial conditions are incorporated. In particular, the apparent relationship between the gravity waves and the squall line suggests that preserving the components of layered internal gravity waves in the model initial conditions may be very important for successful model prediction of the timing and location of wave-related MCSs. Reprints. (JHD)

PENNSYLVANIA STATE UNIV UNIVERSITY PARK DEPT OF METEOROLOGY

(U) Use of Four-Dimensional Data Assimilation by Newtonian Relaxation and Latent-Heat Forcing to Improve a Mesoscale Model Precipitation Forecast: A Case Study.

DEC 88 24P

DESCRIPTORS: (U) \*GRAVITY WAVES, \*THUNDERSTORMS, \*FLOODING, \*RAINFALL INTENSITY, \*WEATHER FORECASTING, GRIDS, INTERACTIONS, INTERNAL WAVES, MATHEMATICAL MODELS, MOTION, NUMERICAL ANALYSIS, PERTURBATIONS, PHYSICAL PROPERTIES, POSITION(LOCATION), PREDICTIONS, PRESSURE, REPRINTS, RESOLUTION, RIDGES, SIMULATION, STORMS, SURFACE PROPERTIES, TEMPERATURE, THREE DIMENSIONAL, TIME, TROUGHS, VERTICAL ORIENTATION, WAVE PROPAGATION, GROUND LEVEL.

PERSONAL AUTHORS: Wand, Wei; Warner, Thomas T.

CONTRACT NO. AFOSR-88-0050

PROJECT NO. 2310

TASK NO. A1

IDENTIFIERS: (U) PEB1102F, WUAFOSR2310A1, Squall lines.

MONITOR: AFOSR  
TR-89-0601

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Monthly Weather Review, v116  
n12 p2593-2616 Dec 88.

ABSTRACT: (U) A mesoscale model has been used in a study of special static- and dynamic-initialization techniques that improve a very-short-range forecast of the heavy convective rainfall that occurred in Texas, Oklahoma and Kansas during 9-10 May 1979, the SESAME IV study period. In this study, the model is initialized during the precipitation event. Two types of four-dimensional data assimilation (FDDA) procedures are used in the dynamic-initialization experiments in order to incorporate data during a 12-hour preforecast period. With the first type, FDDA by Newtonian relaxation is used to incorporate sounding data during the preforecast period. With the second FDDA procedure, radar-based precipitation-rate estimates and hourly raingage data are used to define a three-dimensional latent-heating rate field that contributes to the diabatic heating term in the model's thermodynamic equation during the preforecast period. Combined use of either the preforecast or in-forecast latent heat forcing with the Newtonian relaxation alone. Even though both the experimental static and dynamic-initialization procedures produces considerably improved very short range precipitation forecasts, compared to the control, the experimental static-initialization procedure

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that used latent heat forcing during the first forecast hour did slightly better for this case. Reprints. (JMD)

DESCRIPTORS: (U) \*CONVECTION(ATMOSPHERIC), \*WEATHER FORECASTING, \*ATMOSPHERE MODELS, \*DIGITAL SIMULATION, \*LATENT HEAT, SHORT RANGE(TIME), FOUR DIMENSIONAL, HEAT TRANSFER, HIGH RATE, KANSAS, OKLAHOMA, PRECIPITATION, RAINFALL, RELAXATION, REPRINTS, ATMOSPHERIC SOUNDING, TEXAS, THERMODYNAMIC PROPERTIES, THERMODYNAMICS

IDENTIFIERS: (U) PE61102F, WUAFOSR2301A1.

AD-A208 572 12/1

RUTGERS - THE STATE UNIV NEW BRUNSWICK N J HILL CENTER FOR THE MATHEMATICAL SCIENCES

(U) A RUTCOR Project on Discrete Applied Mathematics.

DESCRIPTIVE NOTE: Final rept. 1 Aug 85-30 Sep 88.

JAN 89 47P

PERSONAL AUTHORS: Hammer, Peter L.; Roberts, Fred S.

CONTRACT NO. AFOSR-85-0271

PROJECT NO. 2304

TASK NO. B1

MONITOR: AFOSR  
TR-89-0619

UNCLASSIFIED REPORT

ABSTRACT: (U) This project has been concerned with theoretical, algorithmic, and applied research in six areas of discrete applied mathematics. Work on graph theory and its applications has been concerned with graph coloring and stability, special classes of graphs, and graphs and discrete optimization. Work on discrete optimization has also dealt with location problems, preprocessing and decomposition, approximation, and applications of combinatorial optimization to nonlinear problems. Our research on posets and other combinatorial structures and their applications has been concerned with linear extensions and ideals, graphs and posets, posets and discrete optimization, and other useful combinatorial structures. Our effort in the area of computational complexity and efficient algorithms has concentrated on foundations on computational complexity and heuristics. Work on applications of discrete mathematics to decisionmaking has involved group decisionmaking, measurement and decisionmaking, and multiple conclusion logic. Our work on large scale scheduling problems has concentrated on the SDRAM I and SDRAM II models for routing aircraft, the aircrew scheduling problem, and the single base aircrews staging problem. Among the many applications we have considered are frequency assignment, task scheduling and air crew scheduling, location of warehouses and communication centers, maintenance

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problems, communications over noisy channels, and expert systems (KR)

MARYLAND UNIV BALTIMORE

DESCRIPTORS: (U) \*APPLIED MATHEMATICS, ADAPTERS, AIRCRAFT, ALGORITHMS, COLORING, COMBINATORIAL ANALYSIS, COMMUNICATION AND RADIO SYSTEMS, COMPUTATIONS, DECOMPOSITION, EFFICIENCY, FLIGHT CREWS, FREQUENCY ALLOCATION, GRAPHS, HEURISTIC METHODS, MAINTENANCE, MATHEMATICS, NONLINEAR SYSTEMS, OPTIMIZATION, SCHEDULING, STRUCTURES, THEORY, WAREHOUSES.

(U) Control and System Theory, Optimization, Inverse and Ill-Posed Problems.

DESCRIPTIVE NOTE: Final rept. 15 Sep 87-14 Sep 88.

SEP 88 10P

PERSONAL AUTHORS: Seidman, Thomas I.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2304B1.

\* CONTRACT NO. AFOSR-87-0350

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-89-0618

UNCLASSIFIED REPORT

ABSTRACT: (U) This final report summarizes research activities in applied mathematics, including control of distributed systems, optimization, an inverse problems. The report summarizes results published in 23 journal articles. Results include a new method for computing solutions to ill-posed problems via optimal filtering and new results for the analysis and control of switching systems. (KR)

DESCRIPTORS: (U) \*APPLIED MATHEMATICS, \*CONTROL THEORY, DISTRIBUTION, FILTERS, INVERSION, OPTIMIZATION, SOLUTIONS(GENERAL), SWITCHING, SYSTEMS ANALYSIS

IDENTIFIERS: (U) PEG1102F, WUAFOSR2304A1.

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THRALL (ROBERT M) AND ASSOCIATES HOUSTON TEX

(U) Workshop on Decision Information for Tactical Command and Control

DESCRIPTIVE NOTE: Final rept.

77

3P

PERSONAL AUTHORS: Thrall, Robert M.

CONTRACT NO. F44620-76 C-0131

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR 89-0746

UNCLASSIFIED REPORT

AD-A208 568

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BROWN UNIV PROVIDENCE RI LEFSCHETZ CENTER FOR DYNAMICAL SYSTEMS

(U) Routing and Singular Control for Queueing Networks in Heavy Traffic,

APR 89 51P

PERSONAL AUTHORS: Martins, Luiz F.; Kushner, Harold J.

REPORT NO. LCDS-89-9

CONTRACT NO. DAAL03-86-K-0171

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-89 0699

UNCLASSIFIED REPORT

DESCRIPTORS: (U) COMMAND AND CONTROL SYSTEMS, WORKSHOPS, TACTICAL COMMUNICATIONS, SYMPOSIA.

IDENTIFIERS: (U) PE81102F, WUAFOSR2304A5

ABSTRACT: (U) The problem of routing control in an open queueing network under conditions of heavy traffic and finite (scaled) buffers is dealt with. The operating statistics can be state dependent. The sequence of scaled controlled state processes converges to a singularly controlled reflected diffusion (with the associated costs) under broad conditions. Due to the nature of the controls, a 'scaling' method is introduced to get the convergence, since the actual sequence of processes does not necessarily converge in the Skorohod topology. Owing to finite buffers, an extension of the reflection mapping needs to be obtained. The optimal value functions for the physical processes converge to the optimal value function of the limit process, under broad conditions. Approximations to the optimal control for the limit process are obtained, as well as properties of the sequence of physical processes. The optimal or controlled (but not necessarily optimal) limit process can be used to approximate a large variety of functionals of the optimal or controlled (but not necessarily optimal) physical processes. (KR)

DESCRIPTORS: (U) NETWORKS, QUEUEING THEORY, ROUTING, BUFFERS, CONTROL, DIFFUSION, FUNCTIONS, MAPPING, OPTIMIZATION, REFLECTION, SCALING FACTORS, SEQUENCES.

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TOPOLOGY, TRAFFIC

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BROWN UNIV PROVIDENCE RI LEFSCHETZ CENTER FOR DYNAMICAL SYSTEMS

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A1

(U) A Uniformly Differentiable Approximation Scheme for Delay Systems Using Splines.

APR 89 51P

PERSONAL AUTHORS: Ito, K.; Kappel, F.

REPORT NO. LCDS/CCS-89-8

CONTRACT NO. AFOSR-84-0398

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR 89-0698

UNCLASSIFIED REPORT

ABSTRACT: (U) A new spline-based scheme is developed for linear retarded functional differential equations within the framework for semigroups on a certain Hilbert space formula. The approximating semigroups inherit in uniform way the characterization for differentiable semigroups from the solution semigroup of the delay system (e.g., among other things the logarithmic sectorial property for the spectrum). The authors prove convergence of the scheme in state spaces. The uniform differentiability of the approximating semigroups enables us to establish error estimates including quadratic convergence for certain classes of initial data. They also apply the scheme for computing the feedback solutions to linear quadratic optimal control problems. (kr)

DESCRIPTORS: (U) APPROXIMATION(MATHEMATICS), CONVERGENCE, DELAY, ERROR ANALYSIS, ESTIMATES, FEEDBACK, FORMULATIONS, HILBERT SPACE, QUADRATIC EQUATIONS, SOLUTIONS(GENERAL), SPLINES, LINEAR DIFFERENTIAL EQUATIONS.

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MASSACHUSETTS INST OF TECH CAMBRIDGE CENTER FOR SPACE RESEARCH

TEXAS UNIV AT AUSTIN DEPT OF COMPUTER SCIENCES

(U) Superconductivity and Magnetism in Layered Materials.

(U) Theoretical Analysis of Models for Texture.

DESCRIPTIVE NOTE: Final rept. 15 Oct 87-14 Oct 88.

DESCRIPTIVE NOTE: Final rept..

MAY 89 13P

MAR 80 5P

PERSONAL AUTHORS: Dresselhaus, M. S.; Dresselhaus, G.

PERSONAL AUTHORS: Davis, Larry S.

CONTRACT NO. AFOSR-88-0021

CONTRACT NO. F49620-79-C-0043

PROJECT NO. 2306

PROJECT NO. 2304

TASK NO. C1

TASK NO. A2

MONITOR: AFOSR  
TR-89-0719MONITOR: AFOSR  
TR-89-0743

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) During the one year period of this grant October 15, 1987-October 14, 1988, efforts on the Program Superconductivity and Magnetism in Layered Materials were largely focused on introduction of our new program in high temperature superconductivity. We also completed studies of magnetic and superconducting graphite intercalation compounds. Superconductivity, Magnetism, Superconductors, Layered materials, Graphite, Intercalated compounds. (mjnm)

ABSTRACT: (U) During the period covered by this contract, technical advances were made in the general area of describing image textures in terms of the spatial distribution of local features, such as edges, in the texture. The first contribution concerned the theoretical development of a minimal error one dimensional edge detector for image models which can be used to describe textures. The second contribution was a comparative classification study of texture statistics derived from gray level and edge cooccurrence matrices. The third contribution was the development of a new computational tool for analyzing textures, called a polarogram. The polarogram is a rich source of directionally sensitive texture statistics which are invariant to image orientation. This research was documented in seven reports and papers. (KR)

DESCRIPTORS: (U) \*SUPERCONDUCTORS, \*LAMINATES, GRAPHITE, HIGH TEMPERATURE, LAYERS, MAGNETIC PROPERTIES, SUPERCONDUCTIVITY.

IDENTIFIERS: (U) WUAFOSR2306C1, PE61102F, INTERCALATION COMPOUNDS.

DESCRIPTORS: (U) \*IMAGES, \*SPATIAL DISTRIBUTION, \*TEXTURE, CLASSIFICATION, COMPUTATIONS, INVARIANCE, MODELS, ORIENTATION(DIRECTION), SENSITIVITY, STATISTICS, THEORY, POLAROGRAPHIC ANALYSIS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A2.

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MASSACHUSETTS UNIV AMHERST DEPT OF CHEMICAL ENGINEERING

MCDONNELL DOUGLAS MISSILE SYSTEMS CO ST LOUIS MO

(U) Lagrangian Turbulence Near Walls: Structures and Mixing in Admissible Model Flows.

(U) Chaotic Response of Aerosurfaces with Structural Nonlinearities.

DESCRIPTIVE NOTE: Final rept. 1 Sep 87-31 Dec 88.

DESCRIPTIVE NOTE: Annual technical rept. 1 Mar 88-28 Feb 89.

MAY 89 7P

MAR 89 70P

PERSONAL AUTHORS: Ottino, J.M.

PERSONAL AUTHORS: Hauenstein, Anthony J.; Laurenson, Robert M.

CONTRACT NO. AFOSR-87-0385

PROJECT NO. 2307

REPORT NO. MDC-ATN-E466-014

TASK NO. A2

CONTRACT NO. F49620-88-C-0047

MONITOR: AFOSR

PROJECT NO. 2308

TR-89-0733

TASK NO. A1

UNCLASSIFIED REPORT

MONITOR: AFOSR

TR-89-0651

UNCLASSIFIED REPORT

ABSTRACT: (U) The general objective of work during this period was to bridge the gap between modern ideas from dynamical systems and chaos and more traditional approaches to turbulence. In order to reach this objective we conducted theoretical and computational work on two systems: (i) a perturbed Kelvin cat eyes flow, and (ii) prototype solutions of the Navier-Stokes equations near solid walls. The main results obtained are two-fold: (a) we have been able to produce flows capable of producing complex distributions of vorticity, and (b) we have been able to construct flow fields, based on solutions of the Navier Stokes equations, which are capable of displaying both Eulerian and Lagrangian turbulence. (jhd)

DESCRIPTORS: (U) \*TURBULENT FLOW, \*BOUNDARY LAYER TURBULENCE, COMPUTATIONS, DISTRIBUTION, DYNAMICS, FLOW FIELDS, LAGRANGIAN FUNCTIONS, NAVIER STOKES EQUATIONS, PROTOTYPES, SOLUTIONS(GENERAL), THEORY, VORTICES, WALLS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2307A2, Chaos. Lagrangian turbulence, Eulerian turbulence.

SUPPLEMENTARY NOTE: Prepared in cooperation with Missouri Univ., Rolla.

ABSTRACT: (U) An analytical and experimental research activity is being performed to investigate the chaotic response behavior of aerosurfaces containing discrete structural nonlinearities. Chaos is the paradoxical emergence of random-like motion in completely deterministic nonlinear systems. This research is developing an understanding of an aerosurface containing discrete structural nonlinearities. The dynamic behavior of a rigid aerosurface has been investigated analytically and experimentally. The rigid surface analysis and test activities are to be continued. A flexible aerosurface will be designed and fabrication begun during the second year. The third year of the program will move to test and analysis of the flexible aerosurface. Studies have been performed for a long range of rigid aerosurface configurations and various root spring stiffnesses and nonlinearities. Test apparatus has been designed and fabricated to experimentally demonstrate the nonlinear behavior of a rigid aerosurface containing discrete

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structural nonlinearities. Wind tunnel testing for the rigid aerosurface configuration has been initiated and evaluation of the results of the wind tunnel tests is underway. Initial design and fabrication of the rigid aerosurface dynamic test setup was completed. (JHD)

IDENTIFIERS: (U) PE61102F, WUAFOSR2308A1.

AD-A208 432

MARYLAND UNIV COLLEGE PARK DEPT OF ELECTRICAL ENGINEERING

(U) Optically Controlled Devices and Ultrafast Laser Sources for Signal Processing.

DESCRIPTIVE NOTE: Final technical rept. 1 Dec 87-30 Nov 88.

FEB 89 46P

PERSONAL AUTHORS: Lee, Chi H.; Goldhar, Julius; Ho, P.-T.

CONTRACT NO. AFOSR-88-0083

PROJECT NO. 2301

TASK NO. A1

MONITOR: AFOSR  
TR-89-0658

UNCLASSIFIED REPORT

ABSTRACT: (U) This report summarizes two significant achievements from this research: (1) successful development of a CW mode-locked Nd: glass laser system which is capable of delivering 0.5 ps pulses with 11 micron J/pulse at 400 Hz, 30 fs pulses with 70 nJ/pulse at 40C Hz. This is a world record at this wavelength, (2) natural and synthetic diamond photoconductive devices have been developed for high field (> MV/cm and high-speed (ps) applications. There are five (5) publications included here as appendices. (rh)

DESCRIPTORS: (U) \*GLASS LASERS, \*LASERS, \*SIGNAL PROCESSING, HIGH RATE, SOURCES.

IDENTIFIERS: (U) PE61102F, WUAFOSR2301A1.

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MCDONNELL DOUGLAS RESEARCH LABS ST LOUIS MO

(U) The Structure of Normal-Shock/Turbulent-Boundary-Layer Interactions Modified by Mass Removal.

DESCRIPTIVE NOTE: Final technical rept. 1 Jun 86-31 Dec 88.

FEB 89 55P

PERSONAL AUTHORS: Sajben, M.; Morris, M. J.; Kroutil, J. C.; Bogar, T. J.

REPORT NO. MDC-QA026

CONTRACT NO. F49620-86-C-0063

PROJECT NO. 2307

TASK NO. A4

MONITOR: AFOSR  
TR-89-0650

UNCLASSIFIED REPORT

ABSTRACT: (U) The effect of mass removal on nominally two-dimensional, normal-shock/turbulent-boundary-layer interactions was investigated experimentally. The flowfield had a freestream approach Mach number of 1.49 and a Reynolds number based on boundary layer momentum thickness of 14,600. Distributed mass removal was imposed over a length of approximately 40 initial displacement thicknesses. The entire bleed zone being located immediately upstream of the shock. Detailed velocity field information was obtained for two flows, using a two component laser Doppler velocimeter system. The two time mean velocity components and the three Reynolds stress components were determined. Measurements were extended over both supersonic and subsonic regions. Surface pressure information was also obtained. The removed mass flow, averaged over the length of the bleed zone, was 2.5% and 8% of the freestream mass flow, for the two cases investigated. The data indicate that the mass removal initiates an oblique expansion wave at the leading edge of the bleed zone, increasing the Mach number of the normal shock. The expansion wave intersects the shock, initiating a weak shear layer in the subsonic flow. The

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boundary layer thickness remains approximately constant over the bleed zone. The streamwise velocity at the perforated plate is high, close to the freestream velocity. Turbulence intensity downstream of the bleed zone is comparable to the intensity of the approach boundary layer, in contrast to uncontrolled interactions in which the turbulence intensity is greatly amplified. Keywords: Transonic flow, Two dimensional flow, Mass transfer, Supersonic inlets. (EDC)

DESCRIPTORS: (U) \*MASS TRANSFER, \*SHOCK WAVES, \*SUPERSONIC INLETS, \*TRANSONIC FLOW, \*TURBULENT BOUNDARY LAYER, BLEED SYSTEMS, BOUNDARY LAYER, DISPLACEMENT, DISTRIBUTION, DOWNSTREAM FLOW, EXPANSION, SUPERSONIC FLOW, FLOW FIELDS, FREE STREAM, INTENSITY, INTERACTIONS, LASER VELOCIMETERS, LAYERS, LEADING EDGES, LENGTH, LOW STRENGTH, MACH NUMBER, MASS, MASS FLOW, MOMENTUM, MOMENTUM TRANSFER, PRESSURE, REMOVAL, REYNOLDS NUMBER, SHEAR PROPERTIES, STRESSES, SUBSONIC CHARACTERISTICS, SUBSONIC FLOW, SUPERSONIC CHARACTERISTICS, SURFACE PROPERTIES, THICKNESS, TURBULENT FLOW, TWO DIMENSIONAL FLOW, VELOCITY.

IDENTIFIERS: (U) Expansion waves, Mass removal, PE61102F, WUAFOSR2307A4.

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LAMONT GEOLOGICAL OBSERVATORY PALISADES N Y

(U) Cloud/Cryosphere Interactions.

and latitudinal distribution of solar insolation reaching the top of the atmosphere are among other factors influencing melt. 4) A southward shift in the mid-winter snow line was found over the central U.S. in the past 50 years. (EDC)

DESCRIPTIVE NOTE: Final rept. Nov 85-Oct 88.

APR 89 46P

DESCRIPTORS: (U) \*CLOUDS, \*SNOW, \*PERMAFROST, AIR FLOW, ALBEDO, ALGORITHMS, ARCTIC OCEAN, ARCTIC REGIONS, BASINS(GEOGRAPHIC), CLIMATOLOGY, CLOUD COVER, DYNAMICS, FEEDBACK, HUMIDITY, MELTING, MOBILITY, PRESSURE, PRESSURE DISTRIBUTION, SEA ICE, SEASONS, SNOW COVER, SURFACE PROPERTIES, SURFACES, THICKNESS, TIME.

PERSONAL AUTHORS: Kukla, George; Robinson, David A.

CONTRACT NO. AFOSR-86-0053

PROJECT NO. 2310

TASK NO. A:

IDENTIFIERS: (U) PE61102F, WUAFOSR2310A1, \*Cryosphere.

MONITOR: AFOSR

TR-89-0590

UNCLASSIFIED REPORT

ABSTRACT: (U) Major objectives included investigating cryospheric dynamics, particularly relationships and feedbacks between clouds and the cryosphere when snow cover is forming or dissipating, and assessing algorithms and climatologies used in A.F. operational snow and cloud cover products. Study results have led to increased understanding of: 1) seasonal and interannual variations in snow and cloud cover, 2) dynamics of the onset of melt season in arctic regions, 3) performance of A.F. nephalanalyses in marginal cryosphere regions, and 4) performance of the A.F. SNOSEP model. Project results include: 1) Cloud cover in the Arctic Basin has a late May early June maximum in extent and thickness, followed by a period of less extensive and thinner cover extending into early August. Cloud conditions are associated with the distribution of surface pressure and the flow of air into the Basin at the surface and aloft. 2) Over arctic lands and sea ice, the timing and duration of the snow melt season, which strongly influence surface mobility of personnel and machinery, vary geographically within a year and across the region from year to year. 3) Increased spring cloudiness and onset of the melt season over sea ice coincide, suggesting that both are related to northward transport of moist air into the Basin by synoptic disturbances, rather than one solely driving the other. Results over arctic lands are less conclusive. Varying conditions of snow pack, surface albedo, seasonal

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AD-A208 327 5/7 12/9

WASHINGTON UNIV SEATTLE

UNIVERSITY OF SOUTHERN CALIFORNIA MARINA DEL REY  
INFORMATION SCIENCES INST

(U) Antiproton and Millimeter Wave Research.

(U) Research in Knowledge Delivery.

DESCRIPTIVE NOTE: Final rept. 30 Jul 86-29 Mar 88.

DESCRIPTIVE NOTE: Final technical rept. 1 Nov 86-30 Sep 88.

JAN 89 3P

PERSONAL AUTHORS: Gabrielse, Gerald

MAR 89 26P

CONTRACT NO. AFOSR-86-0250

PERSONAL AUTHORS: Hovy, Eduard H.; Mann, William C.

PROJECT NO 2917

CONTRACT NO. F49620-87-C-0005

TASK NO. A6

PROJECT NO. 2304

MONITOR: AFOSR  
TR-89-0657

TASK NO. A2

MONITOR: AFOSR  
TR-89-0609

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) The DOD Instrumentation Grant was used to purchase equipment for antiproton experiments and for the production of high frequency microwaves. The antiproton experiments are progressing very nicely. In particular, we have recently cooled antiprotons below 1 eV in energy. Before we started these experiments, the lowest energy antiprotons available had kinetic energies 5 million times higher. The purchased equipment was essential to the antiproton experiments and is being very heavily used. The final version of the millimeter microwave system is completed. It is working although there are still some problems remaining. (AW)

DESCRIPTORS: (U) \*ANTIPROTONS, \*MILLIMETER WAVES, \*TEST EQUIPMENT, ENERGY, HIGH FREQUENCY, MICROWAVE EQUIPMENT, MICROWAVES, PROCUREMENT, PRODUCTION.

IDENTIFIERS: (U) PE61102F, WUAFOSR2917A6.

ABSTRACT: (U) This report summarizes the research and development work done over four years toward the goal of automatically planning and generating fluent multisentence paragraphs of English text. The work consisted of three principal components, namely knowledge representation, grammar development, and text structuring. With respect to knowledge representation, a powerful technique of linking the generator with arbitrary applications was developed by using a very general underlying taxonomy of entities in the world and various specific domain-related taxonomies. As part of grammar development, the invertibility of the grammar in use by the project was investigated, with the eventual goal of developing a combined bidirectional parsing-generation system using the same grammar net-work. Finally, a text structure planner was developed and the whole system was successfully used to generate paragraphs in three different application domains. (kr)

DESCRIPTORS: (U) \*GRAMMARS, \*TEXT PROCESSING, ENGLISH LANGUAGE, TAXONOMY.

IDENTIFIERS: (U) Knowledge representation, PE61102F, WUAFOSR2304A2.

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OTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI32L

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MICHIGAN UNIV ANN ARBOR HARRISON M RANDALL LAB OF PHYSICS

measurement of the temperature of the cosmic background radiation at 2.64 mm. (jhd)

(U) Observing Primeval Galaxies and Dark Matter with LAIRTS.

DESCRIPTORS: (U) \*BACKGROUND RADIATION, \*EXTRATERRESTRIAL RADIATION, ANGLES, AUTOMATION, BACKGROUND, BINARY STARS, CONSISTENCY, DARKNESS, DATA REDUCTION, EVOLUTION(GENERAL), GALAXIES, GRIDS, HIGH LATITUDES, LIGHT, LUMINOSITY, MATCHED FILTERS, MEASUREMENT, POWER SPECTRA, PROFILES, LIGHT SCATTERING, THERMAL PROPERTIES.

DESCRIPTIVE NOTE: Final rept. 1 Feb 85-31 Aug 88.

DEC 88 7P

PERSONAL AUTHORS: Hegyi, Dennis J.

IDENTIFIERS: (U) PE61102F, WUAFOSR2311A1.

CONTRACT NO. AFOSR-85-0120

PROJECT NO. 2311

TASK NO. A1

MONITOR: AFOSR  
TR 89-0575

UNCLASSIFIED REPORT

ABSTRACT: (U) Observations of the extragalactic background light have been made at three wavelengths using our CCD system with a large angular field of view on the McGraw-Hill 1.3 m telescope. Data has been obtained at high galactic latitudes to reduce complications resulting from foreground stars and galaxies and from infrared cirrus. Exposures from overlapping fields were obtained to check the internal consistency of the data. Also, a grid of scattering profiles was obtained in which a star was imaged at many different positions on an off the CCD to take account of scattering contributions. Because the fields contained so many foreground stars and galaxies, it was necessary to develop an automated technique using a matched filter to pick out these objects and to then subtract them from the data. This has been accomplished for fields consisting of one-quarter of a CCD field. Our data analysis has yielded an amplitude for the power spectrum which is about 2.5 times larger than calculated using a model with no galaxy luminosity evolution. Recently, Tyson has shown some clear evidence for galaxy luminosity evolution which while not quantitative qualitatively explains our data. Other work during this funding period has been on the nature of dark matter, speckle interferometric resolution of the binary star system Mu Cassiopeiae, and a

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AD-A208 274 20/4 20/11

WICHITA STATE UNIV KS DEPT OF MATHEMATICS AND STATISTICS

VIRGINIA POLYTECHNIC INST AND STATE UNIV BLACKSBURG  
INTERDISCIPLINARY CENTER FOR APPLIED MATHEMATICS

(U) Ideal Jet Flow in Two Dimensions.

DESCRIPTIVE NOTE: Final rept. 30 Sep 86-31 Jan 89.

(U) Modeling and Computational Algorithms for Parameter  
Estimation and Optimal Control of Aeroelastic Systems  
and Large Flexible Structures.

JAN 89 3P

PERSONAL AUTHORS: Elcrat, A.

DESCRIPTIVE NOTE: Final rept. 30 Sep 85-30 Sep 88.

CONTRACT NO. AFOSR-86-0274

FEB 89 14P

PROJECT NO. 2304

PERSONAL AUTHORS: Burns, J. A.; Cliff, E. M.

TASK NO. A9

CONTRACT NO. AFOSR-85-0287

MONITOR: AFOSR  
TR-89-0411

PROJECT NO. 2304

TASK NO. A3

UNCLASSIFIED REPORT

MONITOR: AFOSR  
TR-89-0600

ABSTRACT: (U) This research has been concerned with two  
dimensional flows of an ideal fluid with concentrated  
regions of vorticity. The methods used involve ideas  
connected with conformal mapping and variational  
principles. (mjm)

UNCLASSIFIED REPORT

DESCRIPTORS: (U) \*JET FLOW, \*VORTICES, CONFORMAL MAPPING,  
FLUIDS, TWO DIMENSIONAL, VARIATIONAL PRINCIPLES.

ABSTRACT: (U) The basic goal of this project is the  
study of computational algorithms for control design of  
partial functional differential equations that model  
structural and fluid dynamic systems. We investigated  
several aspects of the development of computational  
algorithms for identification and control of distributed  
parameter systems. We also spent considerable effort on  
specific applications involving elastic, aeroelastic and  
viscoelastic systems. Progress was made on many of these  
problems. However, in this report we shall concentrate on  
the major accomplishments. (MUM)

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A9.

DESCRIPTORS: (U) \*AEROELASTICITY, \*CONTROL SYSTEMS,  
\*FLEXIBLE STRUCTURES, ALGORITHMS, COMPUTATIONS,  
DIFFERENTIAL EQUATIONS, DISTRIBUTION, ELASTIC PROPERTIES,

ESTIMATES, FUNCTIONAL ANALYSIS, OPTIMIZATION, PARAMETERS,  
PARTIAL DIFFERENTIAL EQUATIONS, VISCOELASTICITY.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A3, Computational  
fluid dynamics.

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ASTRON RESEARCH AND ENGINEERING SUNNYVALE CA

\*SUPERSONIC COMBUSTION RAMJET ENGINES, CONFIGURATIONS,  
DATA PROCESSING, HYPERSONIC CHARACTERISTICS, HYPERSONIC  
VEHICLES, HYPERSONIC VELOCITY, HYPERVELOCITY PROJECTILES,  
LAUNCHERS, LIGHT GAS GUNS, PROPULSION SYSTEMS,  
STABILIZATION, STAGING, TEST FACILITIES.

(U) Demonstration of Oblique Detonation Wave for  
Hypersonic Propulsion.

DESCRIPTIVE NOTE: Final technical rept. 1 Aug 88-31 Jan  
89.

IDENTIFIERS: (U) PE65502F. WUAFOSR3005A1, ODWE(Oblique  
Detonation Wave Engines).

MAR 89 118P

PERSONAL AUTHORS: Nakamura, Takashi; Schuh, Michael J.;  
Randall, Donald S.; Dahm, Thomas J.; Pratt, David T.

REPORT NO. ASTRON-7151-001

CONTRACT NO. F49620-88-C-0130

PROJECT NO. 3005

TASK NO. A1

MONITOR: AFOSR  
TR-89-0659

UNCLASSIFIED REPORT

ABSTRACT: (U) The Oblique Detonation Wave Engine (ODWE)  
offers a number of advantages over the Supersonic  
Combustor Ramjet (SCRAMJET) for hypersonic aeropropulsion.  
The objective of this program is to obtain data on the  
stability of the Oblique Detonation Wave (ODW) and to  
assess the applicability of the ODW to hypersonic  
propulsion. The program consists of the basic study of  
the ODW phenomenon and the design study of the test  
facility (Phase I), and an indepth experimental study of  
the ODW in a ram cannon-type combustion tube with a  
hypervelocity projectile launched into the tube by a two-  
stage light-gas gun (Phase II). This Phase I report  
summarizes the results pertaining to the stability of the  
ODW and the experimental facility designs. It is  
concluded that ODW will be initiated and sustained in the  
test facility configuration and that the tests will  
generate data concerning key issues for the application  
of the ODW to hypersonic propulsion. Oblique, Detonation  
wave, Detonation, Hypersonic propulsion, Hypervelocity  
launcher, Ram accelerator. (mjm)

DESCRIPTORS: (U) \*COMBUSTORS, \*DETONATION WAVES.

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ILLINOIS UNIV AT URBANA DEPT OF CHEMISTRY

(U) 27Al and 29Si NMR (Nuclear Magnetic Resonance) Study of Sol-Gel Derived Aluminosilicates and Sodium Aluminosilicates.

88 7P

DESCRIPTORS: (U) \*ALUMINUM COMPOUNDS, \*SILICATES, \*SODIUM COMPOUNDS, \*GLASS, ALKOXY RADICALS, ALUMINUM, ATOMIC ENERGY LEVELS, BALANCE, BORON OXIDES, CONVERSION, COORDINATES, ENVIRONMENTS, GELATION, GELS, HEAT TREATMENT, METAL COMPOUNDS, NETWORKS, NUCLEAR MAGNETIC RESONANCE, OXIDES, POLYMERS, REPRINTS, SPECTROSCOPY, MOLECULAR STRUCTURE.

PERSONAL AUTHORS: Irwin, A. D.; Holmgren, J. S.; Jonas, J.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303A3.

CONTRACT NO. AFOSR-85-0345

PROJECT NO. 2303

TASK NO. A3

MONITOR AFOSR TR-89-0253

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Materials Science, v23 p2908-2912 1988.

ABSTRACT: (U) The sol-gel process using metal alkoxides is being extensively explored as a method for the preparation of homogeneous multicomponent glasses. In this context, such questions as homogeneity at the atomic level and structural differences between sol-gel and conventionally prepared materials are of great interest. Nuclear magnetic resonance (NMR) spectroscopy is a powerful technique for the study of multicomponent sol-gel systems. Solid state aluminum and silicon 29 NMR was used to examine the structures of aluminosilicates and sodium aluminosilicates prepared by the sol-gel method from metal alkoxides. In contrast to the borosilicate system, where B-O-Si bonds are not formed until heat treatment above 150 C, Al-O-Si formation appears complete upon gelation. Aluminum occupies tetrahedral (AlO<sub>4</sub>)<sup>(-)</sup> sites in the polymer network and octahedral (AlH<sub>2</sub>O)<sub>6</sub>(<sup>3+</sup>) (or similar) sites in the interstices for charge balance. When sodium is added as a counter ion the octahedral aluminum is converted to tetrahedral aluminum in the oxide network. In gels of high aluminum content prepared from (Bu<sub>3</sub>SiO)<sub>2</sub>-Al-O-Si(OEt)<sub>3</sub>, some aluminum in five coordinate environments is also observed. All gels remain amorphous on heating to 800 C. Reprints.

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SCIENTIFIC RESEARCH ASSOCIATES INC GLASTONBURY CT

GALLIUM ARSENIDES, BARRIERS, DOPING, ELECTRIC CURRENT, MOMENTS, MOMENTUM, NUMERICAL ANALYSIS, ONE DIMENSIONAL, POISSON EQUATION, PROFILES, RELAXATION, THICKNESS, VOLTAGE.

(U) Numerical Modeling of Two-Terminal Quantum Well Devices.

DESCRIPTIVE NOTE: Final rept 1 Aug 88-31 Jan 89,

IDENTIFIERS: (U) PE61102F, WUAFOSR3005A1, \*Resonant tunneling devices.

APR 89

PERSONAL AUTHORS: Grubin, H. L.; Kreskovsky, J. P.; Cahay, M. M.

REPORT NO. SRA-R89-910027-F

CONTRACT NO. F49620-88-C-0108

PROJECT NO. 3005

TASK NO. A1

MONITOR: AFOSR  
TR-89-0605

UNCLASSIFIED REPORT

ABSTRACT: (U) This report discusses in detail the results of a Phase I investigation of aluminum gallium arsenide/ gallium arsenide resonant tunneling devices (RTD) using the moment representation of the density matrix equation and the concept of a quantum potential. One dimensional numerical simulations of the density matrix equation (i.e., continuity and momentum-balance equations) and the Poisson's equation were performed. Our study constitutes the first attempt to solve numerically the moments of the density matrix equation. Our numerical simulations, while including the effect of momentum relaxation, show the occurrence of negative differential for a variety of RTD, with different barrier/well thicknesses and heights. The influence of the doping profile throughout the entire device on the current-voltage characteristics was also investigated. Additionally, we have studied the rectifying characteristic of the I-V curve of an asymmetric RTD (with different barrier heights), an interesting feature with potential device applications. (kr)

DESCRIPTORS: (U) \*TUNNELING(ELECTRONICS), \*MATHEMATICAL MODELS, \*QUANTUM THEORY, ALUMINUM GALLIUM ARSENIDE.

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TENNESSEE UNIV KNOXVILLE DEPT OF MATHEMATICS

(U) Special Year on Numerical Linear Algebra.

DESCRIPTIVE NOTE: Final rept. 1 Dec 87-1 Jan 89.

SEP 88

PERSONAL AUTHORS: Bradley, John S.

CONTRACT NO. AFOSR-88-0077

PROJECT NO. 2304

TASK NO. A3

MONITOR: AFOSR  
TR-89-0379

UNCLASSIFIED REPORT

ABSTRACT: (U) During the period 1 Dec 87- 1 Jan 89 leading researchers and students in numerical algebra and related areas of scientific computation and computer science visited the University of Tennessee and Oak Ridge Laboratory. The theme for the year was the solution of numerical linear algebra problems on computers utilizing new parallel computer architectures. Major highlights included the 10th International Symposium on Numerical Algebra; a workshop on each of the three major research areas in the field: systems of equations, eigenvalue problems, and least squares computations; and a year-long research seminar series. Keywords: Problem solving, Symposia. (kr)

DESCRIPTORS: (U) \*LINEAR ALGEBRA, \*NUMERICAL ANALYSIS, ALGEBRA, COMPUTATIONS, COMPUTER ARCHITECTURE, COMPUTERS, EIGENVALUES, EQUATIONS, LABORATORIES, LEAST SQUARES METHOD, LINEARITY, PARALLEL PROCESSORS, PROBLEM SOLVING, STUDENTS, SYMPOSIA, TENNESSEE, UNIVERSITIES.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A3.

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ILLINOIS UNIV AT URBANA DEPT OF MECHANICAL AND INDUSTRIAL ENGINEERING

(U) Experimental and Numerical Studies of Laser Sustained Gas Plasmas.

DESCRIPTIVE NOTE: Final rept. 1 Feb 88-15 Mar 89.

APR 89

PERSONAL AUTHORS: Mazumder, Jyoti; Krier, Herman; Mertogul, Ayhan; Schwartz, Scott; Chen, Xiangli

REPORT NO. UIIU-ENG-89-4005

CONTRACT NO. AFOSR-88-0129

PROJECT NO. 2308

TASK NO. A1

MONITOR: AFOSR  
TR-89-0596

UNCLASSIFIED REPORT

ABSTRACT: (U) Laser propulsion is the production of high specific impulse rocket thrust using a high power laser as a remote energy source. Specific impulses in excess of 1000 seconds are achievable because propellant temperatures are very high and low molecular weight gases can be used. This report focuses on the energy conversion mechanisms of laser-sustained plasmas in pure flowing argon and argon/helium mixtures. Experiments at very high argon mass flux (55 kg/m<sup>2</sup>s) and pressure as high as 2.5 atmospheres have been performed. The results indicate that nearly all the laser power can be absorbed (>97%). Experiments with mixtures of argon and helium indicate that the high specific heat and thermal conductivity of the helium tends to allow for more of the absorbed energy to be retained rather than reradiated to the chamber walls. This despite the fact that the very high ionization energy of helium limits the global absorption to values below that for pure argon plasmas. Fundamental research concerning laser sustained plasmas such as the independent experimental determinations of electron number density and electron number density and electron

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temperature is required. This will allow the evaluation of the local thermal equilibrium which is needed in order to better interpret the spectroscopic and numerical results. Also required is the more accurate determination of downstream plasma exhaust gas temperature via Rayleigh scattering thermometry. This technique is impervious to plasma and laser irradiation interferences and to gas heat loss to the chamber walls, thus thermal efficiency calculations will be much more accurate than in the past. (jhd)

DESCRIPTORS: (U) \*ION PROPULSION, \*LASER PUMPING, \*PLASMAS(PHYSICS), RADIATION ABSORPTION, ACCURACY, ARGON, CHAMBERS, COMPUTATIONS, DETERMINATION, EFFICIENCY, ELECTRON DENSITY, ELECTRON ENERGY, ENERGY CONVERSION, EXPERIMENTAL DATA, GASES, HEAT LOSS, HELIUM, HIGH ENERGY, HIGH POWER, HIGH TEMPERATURE, IONIZATION, IRRADIATION, LASER BEAMS, LIMITATIONS, MIXTURES, NUMERICAL ANALYSIS, POWER LEVEL, PROPELLANTS, PURITY, SPECIFIC HEAT, SPECTROSCOPY, THERMAL CONDUCTIVITY, THERMAL PROPERTIES, THERMAL STABILITY, WALLS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2308A1, \*Laser propulsion, \*Laser produced plasmas.

AD-A208 120 20/11

CORNELL UNIV ITHACA N Y COLL OF ENGINEERING

(U) Nonlinear Dynamics and Control of Flexible Structures.  
DESCRIPTIVE NOTE: Annual rept. 1 Oct 87-30 Sep 88.

MAR 89

PERSONAL AUTHORS: Moon, Francis C.; Gergely, Peter; Thorp, James S.; Abel, John F.

CONTRACT NO. F49620-87-C-0011

PROJECT NO. 2302

TASK NO. B1

MONITOR: AFOSR  
TR-89-0595

UNCLASSIFIED REPORT

ABSTRACT: (U) Chaotic vibrations have been demonstrated in pinjointed truss structure and various factors involved, such as prestress (tension cables), member buckling, joint free-play and friction have been investigated. Modeling techniques have been developed through integration of finite and optimal controls, application of group theoretic concepts, and effective usage of computer graphics. Nonlinear dynamics. Control flexible structures. Chaotic vibrations. (mjm)

DESCRIPTORS: (U) \*FLEXIBLE STRUCTURES, \*NONLINEAR SYSTEMS, \*VIBRATION, CABLES, COMPUTER GRAPHICS, CONTROL, DYNAMICS, FRICTION, METHODOLOGY, MODELS, OPTIMIZATION, TENSION, THEORY, TRUSSES.

IDENTIFIERS: (U) PE61102F, WUAFOSR2302B1.

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CERAMICS PROCESS SYSTEMS CORP CAMBRIDGE MA

nitride.

(U) Highly Oriented Fiber Reinforced Ceramic Composites.

DESCRIPTIVE NOTE: Final rept. 1 Aug 88-31 Jan 89.

MAR 89

PERSONAL AUTHORS: Lee, Ran-Rong; Hodge, James U.; Wei, Wen-Cheng J.; Halloran, John; Schutzberg, Frances

REPORT NO. CPS-89-004

CONTRACT NO. F49620-88-C-0104

PROJECT NO. 3005

TASK NO. A1

MONITOR: AFOSR  
TR-89-0531

UNCLASSIFIED REPORT

ABSTRACT: (U) Highly dense SiC-AlN alloys having unique microstructures and a fracture toughness up to 6 MPam<sup>1/2</sup> were successfully produced by pressureless sintering of commercially available SiC and AlN powders. Appropriate sintering aids, sintering temperatures, sintering period and sintering conditions were identified. The sintered SiC-AlN alloys can achieve a single phase solid solution after an appropriate thermal treatment. The lattice constants of the solid solution varied linearly with SiC/AlN ratio. Optimized annealing yielded decomposition of the solid solution and formed a unique microstructure, which was composed of equiaxed grains with modulated features, heavily faulted elongated grains and very clean grain boundaries. Ceramic composites, Aluminum nitride, Silicon carbide. (jes)

DESCRIPTORS: (U) \*ALUMINUM COMPOUNDS, \*CERAMIC MATERIALS, \*COMPOSITE MATERIALS, \*NITRIDES, \*SILICON CARBIDES, ANNEALING, DECOMPOSITION, FRACTURE(MECHANICS), GRAIN BOUNDARIES, HEAT TREATMENT, MICROSTRUCTURE, OPTIMIZATION, POWDERS, PRESSURE, RATIOS, SINTERING, SOLID SOLUTIONS, TEMPERATURE, TOUGHNESS

IDENTIFIERS: (U) PE61102F, 'UJAF05R3005A1, aluminum

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MICHIGAN UNI/ ANN ARBOR DEPT OF CHEMICAL ENGINEERING

(U) Metal/Metal/In System in Low Temperature Molten Salts

DESCRIPTIVE NOTE: Final rept. 1987-1988.

MAR 89

PERSONAL AUTHORS: Donahue, Francis M.; Simonsen, Leif; Moy, Russell; Mancini, Sara

CONTRACT NO. AFOSR-88-0079

PROJECT NO. 2303

TASK NO. A1

MONITOR: AFOSR  
TR-89-0623

UNCLASSIFIED REPORT

ABSTRACT: (U) Potential arrests on open circuit following passivation of aluminum electrodes and cathodic stripping immediately following passivation were studied in acidic low temperature molten salt solutions (1-methyl-3-ethylimidazolium chloride, MEIC, and aluminum chloride binaries). A model of 'classes' of charge transfer processes which could be responsible for the processes occurring during open circuit decay and cathodic stripping were proposed. Electrochemistry, Electrolyte, Molten salt, Aluminum, Zinc

DESCRIPTORS: (U) CHARGE TRANSFER, ELECTROCHEMISTRY, ALUMINUM, ARRESTING (PROCESS), CIRCUITS, DECAY, ELECTRODES, ELECTROLYTES, FUSED SALTS, LOW TEMPERATURE, MELTS, PASSIVITY, SALTS, ZINC.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303A1.

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NATIONAL HELLENIC RESEARCH FOUNDATION ATHENS (GREECE) THEORETICAL AND PHYSICAL CHEMISTRY INST

(U) Excited Molecules and Clusters in Solid Media. Hydrogen and Tetrahydrogen in Ionic Crystals.

OCT 88

PERSONAL AUTHORS: Nicolaides, C. A.; Valtazanos, P.; Bacalis, N. C.

CONTRACT NO. AFOSR-87-0348

PROJECT NO. 2303

TASK NO. B3

MONITOR: AFOSR  
TR-89-0577

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Chemical Physics Letters, v151 n1.2 p22-26, 7 Oct 88.

ABSTRACT: (U) We present accurate results from full CI calculations on ground and excited states of H2 and (H2)2 embedded in AgF and RbI solids. It is found that the effect of these crystals on the spectra and on the energy surface characteristics is considerable. This finding suggests that, with a suitable selection of solid media, it may become possible to manipulate substantially the electronic spectroscopy and the energy storage and dissipation of certain classes of molecules and clusters. During the past few years, research in our Institute has dealt with the structure and properties of chemically bound excited clusters (CBEC). The existence of this class of species and the development of a theory which makes prediction and accurate calculations feasible, was first proposed in relation to tetrahydrogen, (H2)2, and polyhydrogen, (H2)n, and to the rare gas dihydrides. Recently, this theory - called the maximum ionicity excited state (MIES) theory - was applied to the prediction of the (H2)2 CBEC. Reprints. (jes)

DESCRIPTORS: (U) CRYSTALS, ACCURACY, CLUSTERING, COMPUTATIONS, ELECTRONICS, ENERGY, ENERGY STORAGE, HYDROGEN, IONIC CRYSTALS, MEDIA, MOLECULES, PREDICTIONS.

AD-A208 024



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DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVI32L

AD-A208 024 CONTINUED

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REPRINTS, SELECTION, SOLIDS, SPECTRA, SPECTROSCOPY,  
SURFACE PROPERTIES.

UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES DEPT OF  
CHEMISTRY

IDENTIFIERS: (U) PEG1102F, WUAFOSR2303B3.

(U) Birch Reduction of the Dichlorocarbene Adduct of  
poly(1,1-dimethyl-1-sila-cis-pent-3-ene)(C12C-1):  
Synthesis and Characterization of poly(1,1-dimethyl-3,  
4-methylene-1-sila-cis-pent-3-ene) (CH2-1).

89

PERSONAL AUTHORS: Zhou, Qingshan; Weber, William P.

CONTRACT NO. AFOSR-89-0007

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-89-0589

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Polymer Bulletin, v21 p173-  
177 1989.

ABSTRACT: (U) Birch reduction of the dichlorocarbene  
adduct of poly(1,1-dimethyl-1-sila-cis-pent-3-ene) (C12C-  
1) yields poly(1,1-dimethyl-3,4-methylene-1-sila-cis-pent-  
3-ene) (CH2-1) which has been characterized by <sup>1</sup>H, <sup>13</sup>C  
and 29Si NMR spectroscopy as well as by elemental  
analysis. The molecular weight distribution of CH2-1 has  
been determined by GPC and its thermal stability by TGA.  
Its glass transition temperature was obtained by DSC.  
Keywords: Reduction, Dichlorocarbene, Adducts, Carbenes,  
Chlorine compounds, Silanes, Reprints. (MJM)

DESCRIPTORS: (U) \*CARBENES, \*CHLORINE COMPOUNDS,  
\*SILANES, \*METHYL RADICALS, DISTRIBUTION, GLASS,  
MOLECULAR WEIGHT, REPRINTS, SPECTROSCOPY,  
SYNTHESIS(CHEMISTRY), THERMAL STABILITY, TRANSITION  
TEMPERATURE.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2303B2, pentene/poly  
dimethyl methylene silacis-

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI32L

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AD-A208 022 CONTINUED

CORNELL UNIV ITHACA NY LAB OF ATOMIC AND SOLID STATE PHYSICS

INJECTION, ION SOURCES, LIFE SPAN(BIOLOGY), LOSSES, LOW ENERGY, OPTICS, RAY TRACING, REPRINTS, SCATTERING, SPECTROSCOPY, SURFACE TEMPERATURE, SURFACES.

(U) A Source for Producing Alkali Ion Beams for Low-Energy Surface Scattering Spectroscopies.

IDENTIFIERS: (U) PE61102F, WUAFOFSR2303A2.

APR 89

PERSONAL AUTHORS: PEALE, D. R.; ADLER, D. L.; LITT, B. R.; COOPER, B. H.

CONTRACT NO. AFOSR-88-0069, NSF-DMR85-16616

PROJECT NO. 2303

TASK NO. A2

MONITOR: AFOSR  
TR-89-0578

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Review of Scientific Instruments, v60 n4 p730-734 Apr 89.

ABSTRACT: (U) We present the design and performance of an alkali ion source which is the injection stage of an ion beam system for surface scattering experiments in the range of 10eV to 10keV. In order to maximize emitter lifetimes, emphasis was placed on obtaining low phase space beams which minimize current losses in later stages of the optics. The source is based on a commercially available solid state beta-eucryptite emitter, uses two stages of extraction for independent control of extracted current and final beam energy, and has a modified Pierce confinement electrode to control space charge spreading inside the source. Results of computer ray tracing are included to illustrate the operation of this source. Tests with K<sup>+</sup> ions at 500eV have produced beams which, in the range of 600-700 nA, were space-charge limited in transport through the remainder of the system. Beam currents measured more than 1 m downstream of the source are nearly independent of the emitter surface temperature over a range of 1023 to 1142 C. Reprints. (MJM)

DESCRIPTORS: (U) \*ALKALI METAL COMPOUNDS, \*ION BEAMS, \*POTASSIUM, COMPUTERS, CONFINEMENT(GENERAL), CONTROL, CURRENTS, ELECTRODES, EMITTERS, ENERGY, EXTRACTION,

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI32L

AD-A207 937 17/5 12/5 6/4 AD-A207 937 CONTINUED  
 WORCESTER POLYTECHNIC INST MASS DEPT OF ELECTRICAL  
 ENGINEERING  
 (U) Application of Multi-Channel Hough Transform to Stereo  
 Vision.  
 IDENTIFIERS: (U) PE61102F, WUAFOSR2304A7.  
 DESCRIPTORS: (U) \*ALGORITHMS, \*CHANNELS, \*IMAGES,  
 \*MATCHING, \*TRACKING, \*VISION, NODES, SIZES(DIMENSIONS).

DESCRIPTIVE NOTE: Final rept. 1 Nov 88-30 Oct 89.

MAR 89

PERSONAL AUTHORS: Nasrabadi, Nasser M.

CONTRACT NO. AFOSR-89-0037

PROJECT NO. 2304

TASK NO. A7

MONITOR AFOSR  
 TR-89-0615

UNCLASSIFIED REPORT

ABSTRACT: (U) A major issue in any stereo vision system is the correspondence problem. In this report a feature-based stereo vision technique is described where curve-segments are used as the feature primitives in the matching process. The local characteristics of the curve-segments are extracted by the Generalized Hough Transform (R-table) representation of the curve-segment. The left image and the right image are first filtered by using several Laplacian of a Gaussian operator of different widths (channels). Curve-segments are extracted by a tracking algorithm and their centroids are obtained. At each channel the Generalized Hough Transform of each curve-segment in the left and the right image is evaluated. This is done by calculating the R-table representation of each curve-segment using the centroid of the curve-segment as the reference point. The R-table is used as a local feature vector in representing the distinctive characteristics of the curve-segment. Initial node assignments are formed between the left curve-segments and the right curve-segments if they satisfy the epipolar constraint and their R-tables satisfy a similarity measure. The epipolar constraint on the centroids of the curve-segment and the channel size is used to limit the searching space in the right image. (RH)

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AD-A207 936 20/12 9/1

AD-A207 930 3/1

WISCONSIN UNIV-MADISON DEPT OF ELECTRICAL AND COMPUTER  
ENGINEERING

ARIZONA UNIV TUCSON

(U) Vortices in Long Josephson Junctions.

(U) A Deep Optical Infrared Survey.

DESCRIPTIVE NOTE: Final rept. 15 Nov 85-14 Nov 88,

DESCRIPTIVE NOTE: Final rept. 1 Feb 85-31 Jul 88.

FEB 89

MAR 89 3P

PERSONAL AUTHORS: Nordman, James E.; Beyer, James B.

PERSONAL AUTHORS: Lebofsky, Marcia J.

CONTRACT NO. AFOSR-86-0025

CONTRACT NO. AFOSR-85-0101

PROJECT NO. 2305

PROJECT NO. 2311

TASK NO. C3

TASK NO. A1

MONITOR: AFOSR

MONITOR: AFOSR  
TR-89-0435

TR-89-0422

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) This research involved the study of the properties of long Josephson junction structures and the electronic device possibilities suggested by these structures. A large part of the work involved fabrication and modeling. A particular effort was made to build and to understand the basic operating mechanisms of a type of superconducting transistor, the vortex flow transistor. The thin film fabrication techniques were developed using niobium and lead superconductors. (JHD)

ABSTRACT: (U) This grant was awarded to develop the necessary hardware to carry out a deep sky survey at the near-infrared wavelength of 2 microns. The grant was also to cover an initial operating period after which funding would be sought from other sources to finish the survey. The survey strategy consists of placing a near-infrared array with a silicon charged coupled readout (CCD) at the focus of a transit telescope on Kitt Peak, Arizona. Keywords: Infrared astronomy; Infrared detectors; Charged coupled devices. (Jhd)

DESCRIPTORS: (U) \*JOSEPHSON JUNCTIONS, \*SUPERCONDUCTORS, ELECTRONIC EQUIPMENT, FABRICATION, LEAD(METAL), METHODOLOGY, NIOBIUM, STRUCTURES, THIN FILMS, TRANSISTORS, VORTICES, ELECTRIC CURRENT.

DESCRIPTORS: (U) \*ASTRONOMY, \*INFRARED RADIATION, \*SURVEYS, ARRAYS, CHARGE COUPLED DEVICES, FREQUENCY, INFRARED DETECTORS, INFRARED OPTICAL SYSTEMS, NEAR INFRARED RADIATION, SILICON, SKY.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2305C3, Vortex flow transistors.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2311A1, Infrared astronomy, Infrared sources(Astronomy).

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GEORGIA INST OF TECH ATLANTA SCHOOL OF AEROSPACE  
ENGINEERING

PROPELLANTS, ACOUSTICS, DAMPING, DIFFUSION, MIXING,  
MODELS, OSCILLATION, RESPONSE, ROCKET ENGINES,  
STABILIZATION, STANDING WAVES, THEORY, VALIDATION.

(U) Investigation of the Flame-Acoustic Wave Interaction  
during Axial Solid Rocket Instabilities.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2308A1.

DESCRIPTIVE NOTE: Final rept. 1 Feb 88-31 Jan 89.

MAR 89

PERSONAL AUTHORS: Zinn, B. T.; Hegde, U. G.; Jagoda, J. I.  
; Daniel, B. R.

CONTRACT NO. AFDSR-84-0082

PROJECT NO. 2308

TASK NO. A1

MONITOR: AFOSR  
TR-89-0599

UNCLASSIFIED REPORT

ABSTRACT: (U) The major objectives of the program were  
(i) to determine the characteristics of solid propellant  
gas phase flames in rocket motors experiencing axial  
instabilities and (ii) to determine the validity of state  
of the art solid propellant response models. The program  
was divided into two tasks in order to achieve these  
objectives. In Task I, the response of sidewall  
stabilized premixed flames to longitudinal, standing  
acoustic waves (which simulate the oscillations  
encountered in unstable rocket motors) was studied. A  
premixed flame was chosen for this first phase as it  
eliminated the need to deal with difficulties arising  
from the presence of diffusion processes in the flame  
(these were studied in Task II of the program) while  
providing a flame possessing many important features of  
actual solid propellant flames. A theoretical model of  
the unsteady behavior of such flames, based upon actual  
solid propellant response modes, was developed. Solid  
propellant rocket engines. Combustion instability.  
Premixed flames, Diffusion flames, Acoustic driving.  
Damping. (mjm)

DESCRIPTORS: (U) \*ACOUSTIC WAVES, \*COMBUSTION STABILITY,  
\*FLAMES, \*SOLID PROPELLANT ROCKET ENGINES, \*SOLID

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EV132L

AD-A207 928 20/4 12/1

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DAYTON UNIV OH RESEARCH INST

DESCRIPTORS: (U) \*EDDIES(FLOW MECHANICS, \*JET FLOW, \*MATHEMATICAL PREDICTION, ASYMPTOTIC SERIES, BOUNDARIES, DISTRIBUTION, DOWNSTREAM FLOW, EXPERIMENTAL DATA, EXTERNAL, INCOMPRESSIBLE FLOW, MEAN, MODELS, REGIONS, SIMULATION, STRESSES, THEORY, THREE DIMENSIONAL FLOW, TURBULENCE, TWO DIMENSIONAL FLOW, VELOCITY.

(U) Fast-Algorithm Development for Large-Eddy Simulation of Circular-Jet Turbulence.

DESCRIPTIVE NOTE: Final rept. 1 Jan-31 Dec 88,

MAR 89

IDENTIFIERS: (U) PEG1102F, WUAFOSR2304A3.

PERSONAL AUTHORS: Krishnamurthy, L.

REPORT NO. UDR-TR-89-29

CONTRACT NO. F49620-88-C-0040

PROJECT NO. 2304

TASK NO. A3

MONITOR: AFOSR  
TR-89-0591

UNCLASSIFIED REPORT

ABSTRACT: (U) The research reported herein addresses a theoretical investigation of a free, turbulent round jet issuing into a quiescent ambient, and deals with asymptotic analysis for farfield development and subgrid-scale turbulence modeling and with computational considerations for a large-eddy simulation. Higher-order asymptotic analysis of the fully developed downstream region has uncovered new information for the stress- and pressure-function solutions in the exterior region. The analytical predictions of the centerline decay of the mean axial velocity and those of the radial distributions of the axial and radial mean-velocity components and the shear- and normal - stress components compare well with available experimental data and provide the needed farfield boundary conditions for the large-eddy computations. The numerical considerations for the latter examine the construction of hybrid-difference methods that preserve weak but persistent unsteady features, the two-dimensional jet, and dual-variable algorithm for simulating incompressible three-dimensional flows. Asymptotic structure, Farfield development, Free jet, Large Eddy simulation, Round jet, Subgrid scale turbulence, Turbulence modeling. (mjm)

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SEARCH CONTROL NO. EVI32L

AD-A207 927 12/2

AD-A207 925 20/12 9/1

FLORIDA UNIV GAINESVILLE CENTER FOR MATHEMATICAL SYSTEM THEORY

UTAH UNIV SALT LAKE CITY DEPT OF PHYSICS

(U) Mathematical Techniques for System Realization and Identification.

(U) Fluxons and Order in Long Josephson Junctions.

DESCRIPTIVE NOTE: Final rept. 1 Jul 87-30 Apr 88.

DESCRIPTIVE NOTE: Final rept. 15 Nov 85-14 Nov 88.

JUN 88

FEB 89

PERSONAL AUTHORS: Kalman, Rudolf E.

PERSONAL AUTHORS: Symko, Orest G.

CONTRACT NO. AFOSR-87-0249

CONTRACT NO. AFOSR-86-0020

PROJECT NO. 2304

PROJECT NO. 2305

TASK NO. A1

TASK NO. C3

MONITOR: AFOSR

MONITOR: AFOSR  
TR-89-0604

TR-89-0598

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) Research emphasized algebraic systems theory and the identification of systems for noisy data. Identification, which is based on mathematical (primarily algebraic) ideas has been the area of our main effort. Much work at has been in preparation of re-analyses of published data and exposition of new methods of analysis of noisy data. Research on basics aspects of algebraic system theory has also been active. This research contributes to the study of identification, because it is concerned with deep results about system properties in the exact, that is, noise-free case. (jhd)

DESCRIPTORS: (U) \*DATA REDUCTION, \*IDENTIFICATION SYSTEMS, \*NOISE REDUCTION, \*NUMERICAL METHODS AND PROCEDURES, IDENTIFICATION, MATHEMATICAL ANALYSIS, SYSTEMS ANALYSIS.

IDENTIFIERS: (U) PE61172F, WUAFOSR2304A1.

ABSTRACT: (U) Studies have been made of fluxon dynamics, instabilities, and noise in long overlap type Josephson junctions made out of Niobium Nitride and Niobium. Noise and fluctuations measurements were performed in the voltage state of the junctions biased in a magnetic field. We observed telegraph noise due to fluxon fluctuations between two energy states determined by the geometry of the junction and the external magnetic field bias. The studies covered life-times of these states, metastability, thermal and quantum mechanical tunneling, and effects of dissipation. At certain bias points of the junction we found chaotic behavior which was preceded by period-doubling bifurcation. Also negative resistance regions were observed; they can be used for amplification. These observations were supported by computer modeling using a perturbed sine-Gordon equation. Fluxon motion in long Josephson junctions provides an excellent system for studies of non-linear phenomena and it has a variety of applications to superconducting electronics. Keywords: Josephson junctions; Superconducting electronics; Fluxons; Period doubling bifurcation; Sine gordon equation; Noise; Fluctuations. (jhd)

DESCRIPTORS: (U) \*JOSEPHSON JUNCTIONS, \*NEGATIVE RESISTANCE CIRCUITS, BIAS, COMPUTERIZED SIMULATION, DYNAMICS, ELECTRONICS, EXTERNAL, GEOMETRY, MAGNETIC FIELDS, MECHANICAL PROPERTIES, NIOBIUM, NIOBIUM COMPOUNDS.

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NITRIDES, NOISE(ELECTRICAL AND ELECTROMAGNETIC, NONLINEAR SYSTEMS, QUANTUM ELECTRONICS, QUANTUM THEORY, SUPERCONDUCTIVITY, THERMAL PROPERTIES, TUNNELING, VOLTAGE.

TEXAS A AND M UNIV COLLEGE STATION DEPT OF MATHEMATICS  
(U) Computations of Optimal Controls and Designs for Distributed Systems in Optics and Elasticity.

IDENTIFIERS: (U) PE61102F, WUAFOSR2305C3, Sine Gordon equation, \*Fluxons.

DESCRIPTIVE NOTE: Final project rept. 1 Jan-31 Dec 88.

MAR 89

PERSONAL AUTHORS: Chen, Goong; Zhou, Jianxin

CONTRACT NO. AFOSR-88-091

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-89-0593

UNCLASSIFIED REPORT

ABSTRACT: (U) The boundary element methods are studied for a variety of partial differential equations in optics and elasticity, including the Helmholtz equation on an exterior domain, the eigenvalue problem for the Laplacian, the elastostatic Timoshenko plate and 3-dimensional elastostatic solid mechanics. Numerical software has been accumulated and computer graphics has been successfully developed. (jhd)

DESCRIPTORS: (U) \*NUMERICAL METHODS AND PROCEDURES, \*PARTIAL DIFFERENTIAL EQUATIONS, BOUNDARIES, COMPUTATIONS, COMPUTER GRAPHICS, COMPUTER PROGRAMS, CONTROL, DISTRIBUTION FUNCTIONS, EIGENVALUES, ELASTIC PROPERTIES, EXTERNAL, NUMERICAL ANALYSIS, OPTICS, OPTIMIZATION.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A1, Boundary element methods, Helmholtz equation.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI32L

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AD-A207 910 20/9 14/2

CARNEGIE-MELLON UNIV PITTSBURGH PA

STANFORD UNIV CA HIGH TEMPERATURE GASDYNAMICS LAB

(U) Some Mathematical Problems in Continuum Mechanics.

(U) Fundamental Processes in Partially Ionized Plasmas.

DESCRIPTIVE NOTE: Final technical rept. 30 Sep 85-29 Sep 88

DESCRIPTIVE NOTE: Final rept. 1 Aug 86-31 Jul 88.

SEP

AUG 88

PERSONAL AUTHORS: Hrusa, William J.

PERSONAL AUTHORS: Kruger, C. H.

CONTRACT NO. AFOSR-85-0307

CONTRACT NO. AFOSR-86-0225

PROJECT NO. 2304

PROJECT NO. 2917

TASK NO. AJ

TASK NO. A6

MONITOR: AFOSR  
TR-89-0594

MONITOR: AFOSR  
TR-89-0613

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) Efforts were devoted to the mathematical analysis of problems arising in continuum mechanics. Most of the problems considered were dynamic and involved nonlinear partial differential equations of integrodifferential equations. Specific areas of study include viscoelasticity, thermoelasticity. Specific work includes: Construction of models on global existence and asymptotic stability for several associated initial value problems; nonlinear thermoelasticity when heat conduction is governed by Cattaneo's relation rather than Fourier's law; and results concerning local existence in three spatial dimensions and formation of singularities in one spatial dimension in nonlinear thermoelasticity. (jhd)

DESCRIPTORS: (U) \*CONTINUUM MECHANICS, \*THERMOELASTICITY, ASYMPTOTIC SERIES, DIFFERENTIAL EQUATIONS, INTEGRAL EQUATIONS, MATHEMATICAL ANALYSIS, NONLINEAR DIFFERENTIAL EQUATIONS, NONLINEAR SYSTEMS, PARTIAL DIFFERENTIAL EQUATIONS, SPATIAL DISTRIBUTION, STABILITY, THERMAL CONDUCTIVITY, VISCOELASTICITY.

IDENTIFIERS: (U) WJAFOSR2304AJ, PEG1102F.

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ABSTRACT: (U) The purpose of this program has been to provide modern plasma sources and data acquisition capability for the ongoing research program on Fundamental Processes in Partially Ionized Plasmas. Under this Grant Stanford has acquired, installed, and characterized a 50kW induction plasma torch system and associated diagnostic, and has modernized the data acquisition capability through micro-computer systems. This new equipment has had a very favorable effect on the experimental capability and has already contributed to the research output. (jhd)

DESCRIPTORS: (U) \*IONIZATION, \*PLASMAS(PHYSICS) DATA ACQUISITION, MICROCOMPUTERS, OUTPUT, SOURCES, COMPUTER APPLICATIONS, PLASMA DEVICES.

IDENTIFIERS: (U) PEG1102F, WJAFOSR2917A6, Partially ionized plasmas.

## UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI32L

AD-A207 908 9/5

AD-A207 888

12/1

CITY COLL NEW YORK INST FOR ULTRAFAST SPECTROSCOPY AND LASERS

COLUMBIA UNIV NEW YORK DEPT OF MATHEMATICS

(U) Subpicosecond Optical Digital Computation Using Conjugate Parametric Generators.

(U) Differential Equations, Related Problems of Padé Approximations and Computer Applications.

DESCRIPTIVE NOTE: Final rept. Dec 87-Nov 88.

DESCRIPTIVE NOTE: Final technical rept. 1 Jan 87-31 Dec 88.

MAR 89

DEC 88

PERSONAL AUTHORS: Alfano, Robert; Eichmann, George; Dorsinville, Roger; Li, Yao

PERSONAL AUTHORS: Chudnovsky, D. V.; Chudnovsky, G. V.

REPORT NO. RF-447242

CONTRACT NO. AFOSR-87-0117

CONTRACT NO. AFOSR-88-0039

PROJECT NO. 2304

PROJECT NO. 2305

TASK NO. A4

TASK NO. B4

MONITOR: AFOSR

TR-89-0624

MONITOR: AFOSR

TR-89-0647

UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) Fundamental optical nonlinear processes based on X3 of different materials: organic polymers and liquids, and semiconductors were investigated for size and speed. Ultrafast optical logic devices, switches, and processes based on these nonlinear optical materials were designed, built, and tested. Keywords: Ultrafast technology, Optical computation, Phase conjugation, Nonlinear optics. (JHD)

ABSTRACT: (U) Work focused on the study of analytic, arithmetic and algorithmic properties of differential equations applied to solutions of problems in theoretical mathematics, mathematical and theoretical physics, numerical methods and computer science. Work in the area of effective approximation methods in diophantine geometry, differential equations and computer realizations have progressed in several directions. In diophantine approximations the relationship is studied between complex-analytic and arithmetic (p-adic) properties of linear differential equations using Padé approximations methods. Another part of our work is aimed at complete determination of all (linear) differential equations having arithmetic sense. In many cases it is shown that all these equations arise from Geometry (are variations of period structures of algebraic manifolds). This work of ours is closely connected with the study of the arithmetic properties of classical constants of analysis. The common analytic method in all these studies is the method of Padé approximations to solutions to special linear differential equations. (jhd)

DESCRIPTORS: (U) \*OPTICAL CIRCUITS, \*LOGIC DEVICES, COMPUTATIONS, DIGITAL SYSTEMS, HIGH RATE, NONLINEAR SYSTEMS, OPTICAL EQUIPMENT, OPTICAL MATERIALS, OPTICAL PROCESSING, OPTICS, ORGANIC COMPOUNDS, PARAMETRIC ANALYSIS, POLYMERS, SEMICONDUCTORS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2305B4, Conjugate parametric generators, Ultrafast technology, Nonlinear optics, Phase conjugation.

DESCRIPTORS: (U) \*COMPUTER APPLICATIONS, \*LINEAR DIFFERENTIAL EQUATIONS, \*NUMERICAL METHODS AND PROCEDURES, ALGEBRA, ALGORITHMS, APPROXIMATION(MATHEMATICS).

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SEARCH CONTROL NO. EVI32L

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ARITHMETIC, COMPUTERS, CONSTANTS, DIFFERENTIAL EQUATIONS,  
MATHEMATICAL ANALYSIS.

SRI INTERNATIONAL MENLO PARK CA

IDENTIFIERS: (U) WUAFOSR2304A4, PE61102F, Pade  
approximation, Diophantine approximations,  
Manifolds(Mathematics).  
(U) Metastable Negative Ions and Ion Pair Formation.  
DESCRIPTIVE NOTE: Final rept. 1 Oct 85-15 Oct 88,  
JAN 89

PERSONAL AUTHORS: Peterson, James R.

REPORT NO. SRI-MP-89-015

CONTRACT NO. F49620-85-K-0017

PROJECT NO. 2301

TASK NO. A7

MONITOR: AFOSR  
TR-89-0614

UNCLASSIFIED REPORT

ABSTRACT: (U) Experimental work was directed primarily toward determining properties (energies, lifetimes, autodetachment and photodetachment) of metastable autodetaching negative ions, including He<sup>2+</sup>, Ca<sup>-</sup>, He<sup>-</sup>, and vibrationally detaching OH<sup>-</sup>. Also explored were the dissociative decay mechanisms and pathways of the lower Rydberg states of HeH, NeH, NeD, H<sub>3</sub>, D<sub>3</sub>, H<sub>2</sub>O, OH, and O<sub>2</sub>, using two translational spectroscopic methods. In addition, work was devoted to understanding the mechanisms that could control the behavior of Cs-seeded H-ion sources developed for high energy neutral beam production. Metastable negative ions, Rydberg states, Helium, Hydrogen, Neon, Hydroxide. (MJM)

DESCRIPTORS: (U) \*HELIUM, \*HYDROGEN, \*HYDROXIDES, \*IONS, \*PHOTOCHEMICAL REACTIONS, ANIONS, CHEMICAL DISSOCIATION, DECAY, DISSOCIATION, ION SOURCES, METASTABLE STATE, NEON.

IDENTIFIERS: (U) PE61102F, WUAFOSR2301A7, LPN-SRI-PYU-8767.

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AD-A207 878 12/3

AD-A207 875 17/5

ARIZONA STATE UNIV TEMPE

MASSACHUSETTS UNIV AMHERST DEPT OF COMPUTER AND INFORMATION SCIENCE

(U) On Selecting the Largest Success Probability under Unequal Sample Sizes.

(U) Recognizing 3 D Objects from 2D Images Using Structural Knowledge Base of Genetic Views.

89

DESCRIPTIVE NOTE: Final rept. 1 Oct 85-31 Aug 88.

PERSONAL AUTHORS: Abughalous, Mansour M.; Miescke, Klaus J.

AUG 88

CONTRACT NO. AFOSR-85-0347

PERSONAL AUTHORS: Hanson, Allen R.

PROJECT NO. 2304

CONTRACT NO. AFOSR-86-0021

TASK NO. A5

PROJECT NO. 2304

MONITOR: AFOSR TR-89-0612

TASK NO. A7

MONITOR: AFOSR TR-89-0617

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Statistical Planning and Inference, v21 p53-68 1989.

ABSTRACT: (U) Let  $P_{i1}, P_{i2}, \dots, P_{ik}$  be  $k > 0$  or  $= 3$  independent binomial populations, from which  $X_i$  proportional to  $B(n_i, p_i)$ ,  $i=1, \dots, k$ , respectively, have been observed. The problem under concern is to find that population which is associated with the largest of the unknown 'success probabilities'  $p_1, \dots, p_k$ . Under the 0-1 loss, some linear loss which occurs in gambling, and a general monotone, permutation invariant loss, interesting properties of Bayes rules are studied for priors which are permutation invariant, as well as for priors which are not invariant but have a (DT)-posterior density with respect to some symmetric measure. Examples of independent beta-priors are included. Keywords: Selection of the largest success probability, Rankin Bernoulli trials with unequal sample sizes, Bayes selection rules, Reprints. (JHD)

DESCRIPTORS: (U) \*SELECTION, \*STATISTICAL SAMPLES, \*PROBABILITY, BAYES THEOREM, GAMBLING, INVARIANCE, LOSSES, MONOTONE FUNCTIONS, PERMUTATIONS, POPULATION, REPRINTS, BINOMIALS, SYMMETRY.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A5

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ABSTRACT: (U) Model-based object recognition is an essential task for mobile robotics and assembly. Given an image of a scene containing one or more objects from unknown viewpoints, the goal is to efficiently recognize those objects for which there is sufficient evidence. At the University of Massachusetts, we are developing a model-based object recognition system which is capable of recognizing objects from a large data base of models and from arbitrary viewpoints. Contents: Overview; Extraction of Straight Lines; The View Sphere for Curved Surfaces; Reconstruction of Surfaces from Multiple Views; Predictions and the Prediction Hierarchy Compiler. (FR)

DESCRIPTORS: (U) \*OPTICAL DETECTION, \*PATTERN RECOGNITION, \*IMAGE PROCESSING, \*OPTICAL IMAGES, COMPILERS, CURVATURE, DATA BASES, HIERARCHIES, MATHEMATICAL PREDICTION, ROBOTS, SPHERES, SURFACES, TWO DIMENSIONAL, THREE DIMENSIONAL, GEOMETRIC FORMS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A7, \*Computer vision, \*Object recognition, Views(Optics), Three dimensional objects, Knowledge bases.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI32L

AD-A207 874 22/2

AD-A207 874 CONTINUED

CSA ENGINEERING INC PALO ALTO CA

STRUCTURES, TRANSIENTS.

(U) Admittance Modeling of Structures with Active Controls.

IDENTIFIERS: (U) PE61102F, WUAFOSRD822F1.

DESCRIPTIVE NOTE: Final rept. 1 Dec 87-31 May 88.

MAY 88

PERSONAL AUTHORS: Smith, Kevin E.

REPORT NO. CSA-88-05-08

CONTRACT NO. F49620-88-C-0024

PROJECT NO. D822

TASK NO. F1

MONITOR: AFOSR  
TR-89-0611

UNCLASSIFIED REPORT

ABSTRACT: (U) There are few methods available for analyzing structures or structures with controls that have high-modal densities and/or unmodelable excitations (these are essential characteristics of large space structures). Admittance models do not require that a structure be described in modal coordinates or that excitations be characterized as determinate functions of space. Methods have been developed for the analytical and experimental modeling of actuators and combining them with structural models. A scheme for optimal design of controller impedance using only measured admittance functions was derived and tested. The necessary elements for a hardware demonstration of the theory have been identified. A scheme for design and testing of a structure for verification of the equivalent excitation and structural modification equations has been developed. Large space structures, Control systems, Admittance models, Transient response, Random excitation, Unmanned spacecraft. (jes)

DESCRIPTORS: (U) \*CONTROL SYSTEMS, \*UNMANNED SPACECRAFT, ACTUATORS, ADMITTANCE, CONTROL, COORDINATES, DEMONSTRATIONS, EQUATIONS, EXCITATION, FUNCTIONS, IMPEDANCE, MATHEMATICAL MODELS, MODELS, MODIFICATION, OPTIMIZATION, RESPONSE, SPACECRAFT, STRUCTURAL PROPERTIES.

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AD-A207 873 6/4

AD-A207 873 CONTINUED

ILLINOIS UNIV AT URBANA COORDINATED SCIENCE LAB

(U) Perceptual Structure and Shape from Texture.

DESCRIPTIVE NOTE: Final rept. 15 May 88-14 Mar 89.

MAR 89

PERSONAL AUTHORS: Ahuja, Narendra

CONTRACT NO. AFOSR-88-0219

PROJECT NO. 2304

TASK NO. A7

MONITOR: AFOSR  
TR-89-0616

UNCLASSIFIED REPORT

ABSTRACT: (U) There were two major objectives of our research under grant AFOSR-88-0219. The first of our research concerned perceptual grouping. The goal here is to segment an image into its perceptual components or segments. Such perceptual structure may exist at a range of resolutions. In the second part of our research we were concerned with a computational theory for an integrated representation of texture that takes into account many relevant aspects of texture, rather than just the properties of the texture elements at one level of resolution addressed in the past work. We have made progress towards both of the above mentioned objectives. We have extended our integration approach for perceptual grouping to extract perceptual structure in gray level images. Analogous to the original approach which was applied to dot patterns, the extended approach infers the structure by integrating evidence from region boundaries and region interiors. A large region considered homogeneous may contain regions deemed homogeneous at their own scales. The evidence for region interior is derived by using the multiscale region detector we developed earlier for the shape-from-texture problem. Region borders are also extracted at multiple resolutions, using a nonisotropic edge operator. In integrating the region interior and border information, the region boundary is forced to be smooth using explicit constraints to that effect. (jes)

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DESCRIPTORS: (U) \*ANATOMY, \*IMAGES, COMPUTATIONS, GRAY SCALE, INTEGRATED SYSTEMS, INTEGRATION, INTERNAL, PERCEPTION, REGIONS, TEXTURE, THEORY.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A7.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI32L

AD-A207 872 20/6 20/4

ARIZONA UNIV TUCSON

(U) Nonlinear Behavior in Optical and Other Systems.

DESCRIPTIVE NOTE: Final rept. 1 Jun 84-30 Sep 86.

SEP 86

PERSONAL AUTHORS: Newell, Alan C.

CONTRACT NO. AFOSR-83-0227

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-87-1886

UNCLASSIFIED REPORT

DESCRIPTORS: (U) \*NONLINEAR SYSTEMS, \*OPTICS, \*FLUID  
DYNAMICS, TURBULENCE, PARTIAL DIFFERENTIAL EQUATIONS,  
OPTICAL WAVEGUIDES, KERR MAGNETOOPTICAL EFFECT.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A1, Chaos,  
Solitons.

AD-A207 871 4/2

NORTHWEST RESEARCH ASSOCIATES INC BELLEVUE WA

(U) Propagation and Saturation of Nonlinear Inertia-  
Gravity Waves in the Atmosphere.

DESCRIPTIVE NOTE: Final rept. 15 Feb 86-14 Feb 89.

APR 89

PERSONAL AUTHORS: Dunkerton, Timothy J.

REPORT NO. NWRA-CR-89-R044

CONTRACT NO. F49620-86-C-0026

PROJECT NO. 2310

TASK NO. A1

MONITOR: AFOSR  
TR-89-0626

UNCLASSIFIED REPORT

ABSTRACT: (U) Inertia gravity waves play a significant  
role in the transport of momentum, heat, and constituents  
in the terrestrial atmosphere. This transport process is  
subgrid scale in general circulation models and must be  
parameterized. A generalized parameterization scheme is  
developed in which a gravity wave is subject to localized  
breaking that creates turbulent mixing and retards  
amplitude growth. The effect of turbulence localization  
on turbulent viscosity, diffusivity and mean flow  
acceleration is described for the convectively unstable  
case. Possible generalizations to Kelvin-Helmholtz  
breaking are suggested. Numerical simulations at high  
resolution illustrate the evolution to small scales  
characteristic of convective instability. (JHD)

DESCRIPTORS: (U) \*ATMOSPHERIC MOTION, \*GRAVITY WAVES,  
ACCELERATION, AMPLITUDE, CIRCULATION,  
CONVECTION(ATMOSPHERIC), FLOW, GROWTH(GENERAL), HIGH  
RESOLUTION, KINETIC ENERGY, MEAN, MIXING, MOMENTUM,  
NUMERICAL ANALYSIS, STABILITY, TRANSPORT, TURBULENCE,  
TURBULENT FLOW, VISCOUS FLOW, WAVES.

IDENTIFIERS: (U) PE61102F, WUAFOSR2310A1, \*Turbulent  
mixing, Kelvin Helmholtz instability.

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AD-A207 870 7/3

AD-A207 869 7/3

NORTH TEXAS STATE UNIV DENTON DEPT OF CHEMISTRY

NORTH TEXAS STATE UNIV DENTON DEPT OF CHEMISTRY

(U) Boron Trifluoride Mediated Reaction of 1,9-Dihalopentacyclo(5.4.0.0(2,6).0(3,10).0(5,9)undecane-8, 11-diones with Ethyl Diazoacetate: A Novel Synthetic Entry into the Cyclopent(a)indene Ring System.

88

PERSONAL AUTHORS: Marchand, Alan P.; Reddy, G. M.; Watson, William H.; Nagl, Ante

CONTRACT NO. AFOSR-88-0132

PROJECT NO. 2303

TASK NO. 82

MONITOR: AFOSR

TR-89-0580

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Organic Chemistry, v53 n25 p5969-5971 1988.

ABSTRACT: (U) Reaction of 1,9-dibromo- or 1,9-dichloropentacyclo(5.4.0.02.6.03.10.05.9)undecane-8,11-diones (4 or 5, respectively) with ethyl diazoacetate in the presence of boron trifluoride etherate results in the formation of ethyl 2-bromo- (or ethyl 2-chloro-) 4-hydroxy-3(3aH)-oxo-8,8a-dihydrocyclopent(a)inden-5-carboxylate (6 (42%) and 7 (40%), respectively). A mechanism that accounts for the course of each of the rearrangements 4 yields 6 and 5 yields 7 is suggested. Keywords: Pentacyclicundecanediones, Lewis acid, Catalyzed rearrangement, Ethyl diazoacetate, Cage molecules, Diones, Cyclic compounds, Reprints. (MJM)

DESCRIPTORS: (U) \*BORON COMPOUNDS, \*CYCLIC COMPOUNDS, ETHERS, FLUORIDES, REPRINTS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B2, fluoride/boron tri, diones/dihalopentacyclo.

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89

PERSONAL AUTHORS: Marchand, Alan P.; Dave, Paritosh R.; Rajapaksa, D.; Arney, Benny E., Jr.; Flippen-Anderson, Judith L.

CONTRACT NO. AFOSR-88-0132

PROJECT NO. 2303

TASK NO. 82

MONITOR: AFOSR

TR-89-0585

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Organic Chemistry, v54 n7 p1769-1771 1989.

ABSTRACT: (U) The synthesis of the title compound (1) has been accomplished in seven steps by starting with the readily available 4,4,11,11-bis(ethylenedioxy)pentacyclo(5.4.0.02.6.03.10.05.9)undecane-9-one (2). Thus, 2 was converted into the corresponding oxime, 3 (79%). The oximino group in 3 then was subjected to oxidative bromination with N-bromosuccinimide, thereby affording the corresponding exo-8-nitro derivative, 4 (62%). Sodium borohydride reduction of the C-8r bond in 4 afforded 5 (84%), which was converted subsequently into the corresponding 8,8-dinitro derivative, 6 (83%). Acid promoted hydrolysis of the ethylene ketal moiety in 6 afforded 7 (50%), which was converted subsequently into the corresponding dinitrodioxime, 8 (75%). Oxidative nitration of 8 afforded 1 (19%). The structure of 1 was established unequivocally by single crystal X-ray structural analysis. Keywords: Hexanitropentacycloundecane; Synthesis (chemistry); X ray structure; Cyclic compounds: Decanes; Hexanes; Reprints. (MJM)

DESCRIPTORS: (U) \*CYCLIC COMPOUNDS, \*DECANES, \*HEXANES, \*SYNTHESIS(CHEMISTRY), BROMINATION, CHEMISTRY, HYDROLYSIS.

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AD-A207 868 7/3

OXIDATION, OXIMES, REDUCTION, REPRINTS, SODIUM  
BOROHYDRIDES, X RAYS.

NORTH TEXAS STATE UNIV DENTON DEPT OF CHEMISTRY  
(U) The Structures of Three Strained Cage Molecules,

IDENTIFIERS: (U) PE61102F. WUAFOSR2303B2, undecane/  
hexanitropentacyclo.

89

PERSONAL AUTHORS: Watson, William H.; Nagl, Ante

CONTRACT NO. AFOSR-88-0132

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-89-0584

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Acta Crystallographica, VC45  
p263-267 1989.

ABSTRACT: (U) The nearly perpendicular orientation of the phenyl ring relative to the four atom cyclohexane plane is virtually identical in both (II) and (II'); the respective dihedral angles are 84.2 and 83.0 (2). The analogous angle is 110.0 (1) for (I). If one considers that the shapes of these three molecules may be defined by three wedges meeting at a common vertex (C1) and represented by a plane through each of the cyclohexane and phenyl rings and a plane through the carboxyl group, the three molecules are nearly identical in terms of the relative orientation of these planes. Owing to the geometrical isomerism, of course, the electronic distribution within two of these 'wedges' will be reverse. Keywords: Cyclic compounds; Decanes, Phosphonates; Reprints. (MUM)

DESCRIPTORS: (U) \*CARBOXYL GROUPS, \*CYCLIC COMPOUNDS, \*CYCLOHEXANES, \*PHOSPHONATES, ATOMS, DECANES, DIHEDRAL ANGLE, DISTRIBUTION, ELECTRONICS, MOLECULES, ORIENTATION(DIRECTION), PHENOLS, REPRINTS, RIGHT ANGLES, RINGS, WEDGES.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B2.

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SEARCH CONTROL NO. EV132L

AD-A207 867

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NORTH TEXAS STATE UNIV DENTON DEPT OF CHEMISTRY

(U) Pressure Effect on the Product Distribution in Competing Reactions: Formation of a Bis Diels-Alder Adduct Via an Aromatizable Intermediate.

FEB 89

PERSONAL AUTHORS: Srivastave, S.; Marchand, A. P.; Vidyasagar, V.; Flippen-Anderson, J. L.; Gilardi, R.

CONTRACT NO. AFOSR-84-0085

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-89-0583

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Organic Chemistry, v54 n1 p247-249, 2 Feb 89.

ABSTRACT: (U) The endo mono-adduct of cyclopentadiene with methyl p-benzoquinone does not react with excess diene even if it is well purified (if it is not, aromatization intervenes). However, at pressures of 700-800 MPa (7-8 kbar), the second cycloaddition step overtakes this reaction, and two bis-adducts are formed in a 4:1 ratio. Their configurations were determined by means of X-ray diffraction of derivatives to be endo, anti, endo and endo, anti, exo, respectively. A semicarbazone derivative of the main bis-adduct also could be prepared at high pressure only. The observations again demonstrate the usefulness of high pressure even in routine synthetic transformations. Keywords: High pressure reactions; Diels Alder reaction; Cyclopentadiene; X ray structures; Cyclic compounds; Pentadienes; Reprints. (MUM)

DESCRIPTORS: (U) \*CYCLIC COMPOUNDS, \*CYCLOPENTENES, \*PENTADIENES, DISTRIBUTION, HIGH PRESSURE, PRESSURE, REPRINTS, STRUCTURES, TRANSFORMATIONS, X RAYS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B2, cyclopentadiene.

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20/4

ARIZONA UNIV TUCSON DEPT OF AEROSPACE AND MECHANICAL ENGINEERING

(U) Experimental and Numerical Investigation of Coherent Structures in Turbulent Wake Flows.

DESCRIPTIVE NOTE: Final scientific rept. 6 Feb 85-5 Aug 88,

APR 89

PERSONAL AUTHORS: Champagne, Frank H.

CONTRACT NO. AFOSR-85-0146

PROJECT NO. 2307

TASK NO. A2

MONITOR: AFOSR  
TR-89-0568

UNCLASSIFIED REPORT

ABSTRACT: (U) Large scale coherent structures have been observed in two-dimensional wakes behind bluff bodies as well as non-vortex shedding bodies. There is a strong indication that these large scale structures are related to the two-dimensional instability modes of the slowly diverging mean wake flow. The Orr-Sommerfeld equation admits two solution modes for the two-dimensional plane wake. These are the sinusoidal mode with antisymmetric streamwise fluctuations and the varicose mode with symmetric streamwise fluctuations. The wake response to controlled sinusoidal and varicose types of disturbance waves was investigated. Sinusoidal disturbances at several amplitudes and frequencies were introduced to the wake of a flat plate by oscillating a small trailing edge flap. The Strouhal numbers of the disturbance waves were specially chosen so that the downstream location of the neutral point was well within the range of measurements. The streamwise variation of the half width of the wake and the centerline deficit was dependent on the amplitude level and showed dramatic deviations, starting near the neutral point, at large forcing levels from the well known square root behavior of the unforced case. The measured coherent Reynolds stresses were observed to change sign in the neighborhood of the neutral point as

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CONTINUED

predicted from linear stability theory. The extent of the validity of linear stability theory was investigated. The wake was also forced with a sinusoidal disturbance of lower Strouhal number that was amplified over the entire range of measurements. (edc)

DESCRIPTORS: (U) \*TURBULENT FLOW, \*WAKE, AMPLITUDE, BLUNT BODIES, COHERENCE, FLAPS(CONTROL SURFACES), FREQUENCY, LINEARITY, MEAN, MEASUREMENT, MOMENTUM TRANSFER, NEUTRAL, NUMERICAL ANALYSIS, OSCILLATION, PLATES, POSITION(LOCATION), RESPONSE, SOLUTIONS(GENERAL), SQUARE ROOTS, STABILITY, STRESSES, STRUCTURAL PROPERTIES, STRUCTURES, SYMMETRY, THEORY, TRAILING EDGES, TWO DIMENSIONAL, VARIATIONS, WAVES, WIDTH.

IDENTIFIERS: (U) Instability, divergent flow, Sinuous disturbances, Strouhal number, Linear stability theory, Disturbance waves, PE61102F, WUAFOSR2307A2.

AD-A207 860

7/3

NORTH TEXAS STATE UNIV DENTON DEPT OF CHEMISTRY

(U) Cycloaddition of Anion Derived Homophthalic Anhydride to cis,cisoid,cis-Tricyclo(6.3.0.0(2,6))undeca-4,9-diene-3,11-dione. Aromatization as a Driving Force for Intramolecular Sigmatropic Hydrogen Transfer.

89

PERSONAL AUTHORS: Marchand, Alan P.; Annapurna, Pendri; Watson, William H.; Nagl, Ante

CONTRACT NO. AFOSR-88-O132

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-89-0582

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of the Chemical Society, Chemical Communication, p281-282 1989.

ABSTRACT: (U) Reaction of the anion derived from homophthalic anhydride with cis, cisoid, cis-tricyclo-(6.3.0.0 2,6) undeca-4,9-diene-3,11-dione proceeds via initial Diels-Alder cycloaddition followed by intramolecular dyotropic hydrogen migration with concomitant aromatization. The structure of the reaction product (formed in 42% yield) was established via single crystal X ray structural analysis. Keywords: Dyotropic hydrogen shift, Reaction mechanism, Homophthalic anhydride, Diels Alder, Cycloaddition, X ray structure, Anhydrides, Dienes, Reprints. (MUM)

DESCRIPTORS: (U) \*ANHYDRIDES, \*CYCLIC COMPOUNDS, \*DIENES, ANIONS, FORCE(MECHANICS), HYDROGEN, MIGRATION, REPRINTS, RESPONSE, SHIFTING, X RAYS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B2, dione/undecatricyclo.

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## DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVI32L

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NORTH TEXAS STATE UNIV DENTON DEPT OF CHEMISTRY

(U) 2,3:6,7-Bis(2'-quinolino)pentacyclo(6.5.0.0(4,12).0(5,10).0(9,13))tridecane.

88

PERSONAL AUTHORS: Marchand, Alan P.; Annapurna, Pendri; Flippen-Anderson, Judith L.; Gilardi, Richard; George, Clifford

CONTRACT NO. AFOSR-88-0132

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-89-0581

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Tetrahedron Letters, v29 n51 p6681-6684 1988.

ABSTRACT: (U) The title compound was synthesized by two sequential Friedlander condensations between prentacyclic bis(ketoester) and ortho-aminobenzaldehyde. The dihedral angle between two the quinoline rings is 76.4; the nonbonded N...N interatomic distance is 4.32 Å. Reprints, Molecular clefts, X ray structure, Friedlander condensation, Decanes, Quinolines. (MUM)

DESCRIPTORS: (U) \*DECANES, \*QUINOLINES, CONDENSATION, DIHEDRAL ANGLE, REPRINTS, RINGS, X RAYS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B2, tridecane/bis 2,3-quinolopentacyclo.

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NORTH TEXAS STATE UNIV DENTON DEPT OF CHEMISTRY

(U) Lewis Acid Promoted Reactions of Substituted Pentacyclo(5.4.0.0(2,6).0(3,10).0(5,9))undecane-8,11-diones with Ethyl Diazoacetate.

89

PERSONAL AUTHORS: Marchand, Alan P.; Annapurna, Pendri; Reddy, S. P.; Watson, William H.; Nagl, Ante

CONTRACT NO. AFOSR-88-0132

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-89-0586

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Organic Chemistry, v54 n1 p187-193 1989.

ABSTRACT: (U) As part of a program designed to explore the synthesis and chemistry of novel functionalized polycyclic cage molecules, we recently reported the results of a study of the Lewis acid promoted reaction of pentacyclo-(5.4.0.0 2,6.0 3,10.0 5,9) undecane-8,11-dione (PCUD-8,11-dione, 1) with ethyl diazoacetate (EDA). A single, substituted pentacyclo(6.5.0.0 4,12.0 5,10.0 9,13) tridecane, 2(Scheme I), was isolated from the reaction of 1 with 2 equiv of EDA in the presence of boron trifluoride etherate. The structure of 2 was established via single-crystal X-ray structural analysis. In an effort to extend this reaction to synthesize new derivatives of the pentacyclo(5.0.0 4,11.0 5,9.0 8,12) dodecane ring system, we have undertaken a study of the corresponding boron trifluoride promoted reaction of unsymmetrically substituted PCUD-8,11-diones (i.e., 3 and 4, Scheme II) with 1 equiv of EDA. Keywords: Reprints, Decanes, Cyclic compounds, Acetates. (MUM)

DESCRIPTORS: (U) \*ACETATES, \*CYCLIC COMPOUNDS, \*DECANES, BORON COMPOUNDS, CHEMISTRY, DODECANE, ETHERS, FLUORIDES, REPRINTS, RINGS, SINGLE CRYSTALS, STRUCTURAL ANALYSIS, SYNTHESIS, X RAYS.

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OTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI32L

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AD-A207 852 12/1

IDENTIFIERS: (U) PE61102F. WUAFOSR2303B2. diones/  
pentacycloundecane

IOWA STATE UNIV AMES DEPT OF MATHEMATICS

(U) Numerical Solution of Ill Posed Problems in Partial  
Differential Equations.

DESCRIPTIVE NOTE: Final technical rept. 1 Oct 84-30 Jun  
88.

JUN 88

PERSONAL AUTHORS: Levine, Howard A.

CONTRACT NO AFOSR-84-0252

PROJECT NO. 2304

TASK NO. AJ

MONITOR: AFOSR  
TR-89-0607

UNCLASSIFIED REPORT

ABSTRACT: (U) This project is concerned with several questions concerning the existence, uniqueness, continuous data dependence and numerical computation of solutions of various ill posed problems in partial differential equations. Several problems involving reaction diffusion equations with and without convection terms present were studied. In the latter case the ability of finite element approximate solutions to reproduce the continuous time dynamics was investigated. In the former case, a convective diffusion equation with a semilinear source in the boundary conditions was analyzed. A fairly complete picture of the dynamics was obtained. With the source term in the equation, computations revealed a rich structure which has been partially analyzed theoretically. Several problems for reaction diffusion equations in unbounded regimes were also investigated. It was shown that under certain conditions in the rate law all nonzero solutions blow up in finite time, while for other conditions in the rate law, solutions damp out. It was shown that a potential well theory is possible for certain hyperbolic problems in which a nonlinear boundary condition is prescribed and not possible in certain cases when forcing term in the differential equation is singular. Numerical experiments performed on the wave equation with a singular forcing

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term have down that when quenching occurs, the time and exact derivatives blow up in finite time. The nature of the blowup was studied computationally. (jhd)

DESCRIPTORS: (U) 'NUMERICAL METHODS AND PROCEDURES, PARTIAL DIFFERENTIAL EQUATIONS, BOUNDARIES, COMPUTATIONS, CONVECTION, DIFFUSION, DYNAMICS, FINITE ELEMENT ANALYSIS, HYPERBOLAS, NONLINEAR SYSTEMS, NUMERICAL ANALYSIS, POTENTIAL THEORY, QUENCHING, RESPONSE, SOLUTIONS(GENERAL), TIME, WAVE EQUATIONS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304AU, \*I11 posed problems, Existence theorems, Uniqueness theorems.

AD-A207 848 12/9 5/8 6/4

HARVARD UNIV CAMBRIDGE MA

(U) Components of High-Level Vision: A Cognitive Neuroscience Analysis and Accounts of Neurological Syndromes.

DESCRIPTIVE NOTE: Annual rept. Dec 87-Dec 89,

FEB 89

PERSONAL AUTHORS: Kosslyn, Stephen M.

REPORT NO. TR-89-1

CONTRACT NO. AFOSR-88-0012

PROJECT NO. 2313

TASK NO. A4

MONITOR: AFOSR  
TR-89-0628

UNCLASSIFIED REPORT

ABSTRACT: (U) High-level visual processes make use of stored information, and are invoked during object identification, navigation, tracking, and visual mental imagery. The present work has revolved around a theory of the component processing subsystems used in high-level vision. This theory was developed by considering neuroanatomical, neurophysiological, and computational constraints. The theory has led to three kinds of empirical work: First, specific claims associated with individual processing subsystems have been tested. For example, the analysis of the representation of spatial relations led to the prediction that two subsystems are used to encode this information, and a set of experiments was conducted that provided support for this distinction. Second, predictions from the theory as a whole have been formulated, and some of these predictions are now being tested. And third, the subsystems have been implemented in a running computer simulation model, which has been used to generate predictions about specific neurological syndromes. The model can be damaged in a variety of ways, and its performance on a set of tasks then observed. The experiments conducted to data and predictions from the computer model are summarized in this report. In addition,

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the most common dysfunctions of vision following brain damage are reviewed, and accounts are offered by reference to the simulation model. Keywords: Neuropsychology. Spatial orientation. (aw)

DESCRIPTORS: (U) \*COMPUTERIZED SIMULATION, \*NEUROLOGY, \*INFORMATION PROCESSING, \*VISION, \*PSYCHOPHYSIOLOGY, IDENTIFICATION, MENTAL ABILITY, MODELS, NAVIGATION, OPTICAL IMAGES, ORIENTATION(DIRECTION), SIGNS AND SYMPTOMS, SPATIAL DISTRIBUTION, TRACKING, VISUAL DEFECTS, DRAIN DAMAGE.

IDENTIFIERS: (U) WUAF03R2313A4, PE61102F, \*Neuropsychology. Spatial orientation.

UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES

(U) Addition of Dichlorocarbene to Poly(1,1-dimethyl-1-sila-cis-pent-3-ene) and Poly(1,1-dimethyl-1-sila-cis (and trans)-pent-3-ene). Characterization of Microstructures by 13C and 29Si NMR.

88

PERSONAL AUTHORS: Loker, K. B.; Loker, D. P.

CONTRACT NO. AFOSR-86-0042

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-89-0588

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Micromolecules, v22 n3 p1300-1306 1989.

ABSTRACT: (U) Dichlorocarbene generated under phase transfer catalysis conditions was added to poly(1,1-dimethyl-1-sila-cis-pent-3-ene) (I). Catalytic isomerization of I by photochemically generated phenylthio radicals gave poly(1,1-dimethyl-1-sila-cis (and trans)-pent-3-ene) (II). Dichlorocarbene was also added to II. The microstructures of these dichlorocarbene adduct polymers were characterized by 1H, 13C, and 29Si NMR. Their thermal stabilities were determined by thermogravimetric analysis. They were found to be considerably less stable than the starting polymers I or II. These dichlorocarbene adduct polymers slowly undergo spontaneous depolymerization at room temperature. The mechanisms of this process is considered. Keywords: Dichlorocarbene adduct, Decomposition, Microstructure, Carbenes, Polymers, Silanes, Reprints. (MUM)

DESCRIPTORS: (U) \*CARBENES, \*CATALYTIC CRACKING, \*MICROSTRUCTURE, \*SILANES, CATALYSIS, DECOMPOSITION, DEPOLYMERIZATION, ISOMERIZATION, POLYMERS, REPRINTS, ROOM TEMPERATURE, THERMAL STABILITY, THERMOGRAVIMETRIC ANALYSIS, TRANSFER.

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IDENTIFIERS: (U) WUAFOSR2303B2, PE61102F, carbene/  
dichloro, pentene/dimethyl sila-

TEXAS UNIV AT AUSTIN DEPT OF PHYSICS

(U) Hydrogen Adsorption at Nb(100): Photoemission Evidence  
of Two-Stage Exchange Involving Subsurface States.

88

PERSONAL AUTHORS: Fang, B. S.; Ballentine, C. A.; Erskine,  
J. L.

CONTRACT NO. AFOSR-86-0109

PROJECT NO. 2303

TASK NO. A2

MONITOR: AFOSR  
TR-89-0569

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Surface Science Letters, v204  
pL713-L720 1988.

ABSTRACT: (U) Temperature dependent properties of electronic states resulting from hydrogen adsorption of Nb(100) surfaces have been studied by photoemission spectroscopy using synchrotron radiation. The most prominent hydrogen induced feature in photoemission spectra exhibits a temperature dependence that requires contributions from two distinct states. Analysis of the photon energy dependent cross section of the hydrogen induced features suggests that hydrogen chemisorption sites are located below the surface. These results have important consequences for kinetic models that attempt to account for hydrogen uptake by Nb. Keywords: Surface chemistry, Structure, Electronics properties, Surfaces, Niobium, Reprints. (MUM)

DESCRIPTORS: (U) \*HYDROGEN, \*NIOBIUM, \*SURFACE CHEMISTRY, ADSORPTION, CHEMISORPTION, ELECTRONIC STATES, ELECTRONICS, EXCHANGE, KINETICS, MODELS, PHOTOELECTRIC EMISSION, RADIATION, REPRINTS, SITES, SPECTRA, SPECTROSCOPY, STAGING, SYNCHROTRONS, TEMPERATURE, THERMAL PROPERTIES.

IDENTIFIERS: (U) WUAFOSR2303A2, PE61102F, niobium(100).

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PRINCETON UNIV NJ DEPT OF MECHANICAL AND AEROSPACE  
ENGINEERING

NATIONAL HELLENIC RESEARCH FOUNDATION ATHENS (GREECE)  
THEORETICAL AND PHYSICAL CHEMISTRY INST

(U) Instrumentation Requirements for the Princeton  
University Electric Propulsion Laboratory Research  
Program.

(U) On the Stability of Excited Tetrahydrogen,  
88

DESCRIPTIVE NOTE: Final rept. 1 Aug 86-30 Jul 88.

PERSONAL AUTHORS: Metropoulos, A.; Nicolaides, C. A.

JUL 88

CONTRACT NO. AFOSR-85-0327

PERSONAL AUTHORS: Kelly, A. J.

PROJECT NO. 2303

CONTRACT NO. AFOSR-86-0287

TASK NO. 83

PROJECT NO. 2917

MONITOR: AFOSR  
TR-89-0579

TASK NO. A1

MONITOR: AFOSR  
TR-89-0567

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

Availability: Document partially illegible.

SUPPLEMENTARY NOTE: Pub. in Jnl. of Physics B: Atomic and  
Molecular Opt. Physics, v21 pL77-L81 1988.

ABSTRACT: (U) DoD Instrumentation Grant AFOSR 86-0287  
has provided total funding of \$53,475 distributed over a  
two-year time interval: \$34,790 for year one (8/1/86 thru  
7/31/87) and \$18,685 for the final year (8/1/87 thru 7/30/  
88). This report summarizes all expenditures that have  
been made under this grant. Keywords: Oscilloscopes,  
Tektronix, Thyatron, Procurement. (JES)

ABSTRACT: (U) We report on a minimum of the A'A' excited  
state of the H4 cluster in a Cs trigonal pyramidal  
geometry, which can support at least one vibrational  
level. This minimum is near an avoided crossing with the  
ground 'A' state. The non-adiabatic matrix elements of  
their vibronic coupling along a possible dissociation  
coordinate are also calculated. Keywords: Tetra hydrogen;  
Examiners; Reprints. (KT)

DESCRIPTORS: (U) \*PROCUREMENT, \*LOGISTICS,  
INSTRUMENTATION, OSCILLOSCOPES, REQUIREMENTS, THYATRONS,  
TIME INTERVALS.

DESCRIPTORS: (U) \*MOLECULERMOLUCULE INTERACTIONS,  
\*MOLECULAR VIBRATION, \*HYDROGEN, COORDINATES,  
COUPLING(INTERACTION), DISSOCIATION, LEVEL(QUANTITY),  
REPRINTS.

IDENTIFIERS: (U) PE61102F, WUAF03R2917A1.

IDENTIFIERS: (U) PE61102F, WUAF03R2303B3, \*Tetrahydrogen.

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OKLAHOMA STATE UNIV STILLWATER DEPT OF CHEMISTRY

(U) A Perturbation-Trajectory Method for the Study of Gas-Surface Collision Dynamics.

83

PERSONAL AUTHORS: Jezercak, Michael; Agrawal, Paras M.; Thompson, Donald L.; Raff, Lionel M.

CONTRACT NO. AFOSR-86-0043

PROJECT NO. 2303

TASK NO. 83

MONITOR: AFOSR  
TR-89-0535

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl of Chemical Physics, v90  
n6 p3363-3372, 15 Mar 89.

ABSTRACT: (U) A perturbation trajectory method for determining the dynamics of gas surface collision processes is described. The method is based upon the assumption that the motions of Q zone atoms are unaffected by the collision process at the lattice surface. This assumption leads to a P-zone Hamiltonian that incorporates the effects of Q-zone motion in terms of time-varying P-zone-Q-zone interactions. The collision dynamics of the P zone are determined from an ensemble of stochastic trajectories using this coupled Hamiltonian. The method is applied to three systems: (1) collinear inelastic atomic collisions with a ten-atom chain, (2) the inelastic scattering and absorption of NO on a Ag(111) surface, and (3) the collision and subsequent surface reactions of SiH<sub>2</sub> on a Si(111) surface. Comparison of the perturbation results with those obtained using the full system Hamiltonian shows that under certain conditions the perturbation procedure yields very accurate results with a significant reduction in computational requirements. In general, the accuracy of the perturbation calculations increases as the incident-to-lattice-atom mass ratio decreases. A decrease in the strength of the interaction between the incident molecule and the Q zone, the incident translational energy, or the

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lattice temperature also improves the accuracy of the perturbation treatment. The method is therefore best suited to the study of inelastic, light-molecule collisions with heavy-atom surfaces at low temperature. Comparisons with previously reported gas-surface studies that employ a Langevin approximation are also given. Keywords: Nitrogen oxide, Silicon hydride, Silicon, Reports, Reprints. (MJM)

DESCRIPTORS: (U) \*GAS SURFACE INTERACTIONS, \*HYDRIDES, \*NITROGEN OXIDES, \*SILICON, \*SILVER, ABSORPTION, ACCURACY, ATOMS, COLLISIONS, COMPUTATIONS, COUPLING(INTERACTION), DYNAMICS, ELASTIC PROPERTIES, ENERGY TRANSFER, GAS DYNAMICS, GASES, HAMILTONIAN FUNCTIONS, INELASTIC SCATTERING, INTERACTIONS, LINEARITY, LOW TEMPERATURE, PARTICLE COLLISIONS, PERTURBATIONS, REPRINTS, REQUIREMENTS, STRENGTH(GENERAL), SURFACES, TRAJECTORIES.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B3, silicon hydride.

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CONTINUED

CARNEGIE-MELLON UNIV PITTSBURGH PA

METHODS AND PROCEDURES, OPTIMIZATION, PROBABILITY  
PROBABILITY DISTRIBUTION FUNCTIONS, SEARCHING, STOCHASTIC  
PROCESSES, TEXTURE, THEORY.

(U) Radon Transform Analysis of a Probabilistic Method for  
Image Generation.

IDENTIFIERS: (U) PE61102F, UJAFOSR2304A9.

DESCRIPTIVE NOTE: Annual rept. no. 2, 1 Apr 88-31 Mar 89.

APR 89

PERSONAL AUTHORS: Berger, Marc A.

REPORT NO. AFOSR-87-0137

PROJECT NO. 2304

TASK NO. A9

MONITOR: AFOSR  
TR-89-0606

UNCLASSIFIED REPORT

ABSTRACT: (U) The research performed for this grant over the past year involved affine iterated function system (IFS) encoding and IFS mixing for digital images. This relates to a technique of Michael Barnsley's for generating fractal and other images by randomly iterating affine transformations of the plane into itself. By this technique an image is both generated and represented as the long-term probability distribution for a 2-D or 3-D Markov chain. The encoding involves finding an affine 'collage' of the image, whereby it is identified as a convex combination of affinely scaled versions of itself. This permits some remarkable data compression. The mixing involves a merging of IFS's so as to produce images with combined textures. It ties in with the encoding in that a broader class of images can then be efficiently encoded, and there are more degrees of freedom in the encoding search. The mathematical methods used involve stochastic optimization, computational geometry, the Radon transform, dynamical systems and ergodic theory for Markov chains. Keywords: Encoding, Image compression, Image processing, Markov chain, (MJM)

DESCRIPTORS: (U) \*CODING, \*IMAGE PROCESSING, \*MARKOV  
PROCESSES, COMPRESSION, COMPUTATIONS, DATA COMPRESSION,  
DEGREES OF FREEDOM, DIGITAL SYSTEMS, DYNAMICS, ERGODIC  
PROCESSES, GEOMETRY, IMAGES, LONG RANGE(TIME), NUMERICAL

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ECODYNAMICS RESEARCH ASSOCIATES INC ALBUQUERQUE NM

IDENTIFIERS: (U) PEG1102F, WUAFOSR2304A1, Pironneau  
Polak method, Armijo step size.

(U) Design Optimization of Systems Governed by Partial  
Differential Equations. Phase 1.

DESCRIPTIVE NOTE: Final rept. Aug 88-Jan 89.

MAR 89

PERSONAL AUTHORS: Roache, Patrick J.

REPORT NO. ERA-89-3

CONTRACT NO. F49620-88-C-0124

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-89-0571

UNCLASSIFIED REPORT

ABSTRACT: (U) The results of the Phase I study on  
'Design Optimization of Systems Governed by Partial  
Differential Equations' are presented. The optimization  
algorithm used is the Pironneau-Polak method of feasible  
directions with Armijo step size. This algorithm, and  
related ones are uniquely applicable to practical  
engineering and science problems whose constraints are  
defined implicitly in terms of possibly discontinuous  
functionals of the solution to te PDE's. The objective  
(cost) and constraint functions are evaluated by  
execution, from the optimization code, of a separate (and  
complex) user-oriented PDE code; gradients are determined  
numerically. Feasibility is convincingly demonstrated by  
the design optimization of several practical laser  
electrode problems. Keywords: Shape optimization, Laser  
components, Adaptive grids, Partial differential  
equations. (JHD)

DESCRIPTORS: (U) \*NUMERICAL METHODS AND PROCEDURES,  
\*PARTIAL DIFFERENTIAL EQUATIONS, ADAPTIVE SYSTEMS,  
ALGORITHMS, CODING, COSTS, ELECTRODES, GRIDS, LASER  
COMPONENTS, LASERS, OPTIMIZATION, SHAPE, SIZES(DIMENSIONS)

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AD-A207 811 CONTINUED

STANFORD UNIV CA DEPT OF MECHANICAL ENGINEERING

(U) The Heat Transfer and Fluid Dynamics of Concave Surface Curvature.

DESCRIPTIVE NOTE: Final rept. 1 Jan 86-31 Dec 88.

APR 88

PERSONAL AUTHORS: Bradshaw, P.; Johnston, J. P.; Moffat, R. J.

CONTRACT NO. AFOSR-86-0073

PROJECT NO. 2307

TASK NO. A4

MONITOR: AFOSR  
TR

UNCLASSIFIED REPORT

ABSTRACT: (U) This project investigated the mechanisms responsible for the known increases in shear stress and convective heat transfer when a turbulent boundary layer flows over a concave wall compared to a similar flow over a flat wall. The effects of grid-generated Free-Stream Turbulence (FST level  $\leq 7.5\%$ ) were also examined for flat and concave-wall TBL's. The work was conducted in a large scale boundary layer using low-speed water flow. Momentum thickness  $Re$  was  $\approx 1400$ . Surface heat transfer rate was measured with a constant temperature metal surface and by use of a liquid crystal surface. Temperature profiles were obtained by miniature thermocouple probe down to  $y^+ = 3$  and all three velocity components by a 3-D, laser velocimeter down to  $y^+ = 7$ . Heat transfer and wall shear stress were both found to be augmented by curvature and free-stream turbulence applied separately, but the combined effect of curvature and FST is not simply the sum of the individual effects. In the case of wall stress, the effects of curvature are much larger than FST effects once the flow develops downstream. The nature of the interaction is being investigated using a working hypothesis based on the ideas of active (Reynolds stress producing) and inactive can stimulate only a limited increase (order 25%) in wall friction coefficient. However, for the moderate levels of FST used

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AD-A207 807 12/5

WISCONSIN UNIV-MADISON DEPT OF MATHEMATICS

COMPUTER COMMAND AND CONTROL CO PHILADELPHIA PA

(U) Modelling, Information, Processing, and Control.

(U) An Intelligent Mathematical Modelling System - Mathmodel.

DESCRIPTIVE NOTE: Final scientific rept. 30 Sep 85-29 Sep 88.

DESCRIPTIVE NOTE: Final rept. 1 Aug 88-31 Mar 89.

JAN 89

MAR 89

PERSONAL AUTHORS: Russell, David L.

PERSONAL AUTHORS: Lock, X. Ge.; Prywes, N.

CONTRACT NO. AFOSR-85-0263

CONTRACT NO. F49620-88-C-0116

PROJECT NO. 2304

PROJECT NO. 3005

TASK NO. A1

TASK NO. A1

MONITOR: AFOSR  
TR-89-0527

MONITOR: AFOSR  
TR-89-0530

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) Research was conducted in identification and control of distributed parameter systems, particularly damping mechanisms in distributed elastic systems, modeling of flexible structures, control of systems with nonlinear behavior and control of systems with solitary waves. A thorough analysis of damping mechanisms in elastic systems was carried out, including common classical forms of damping, and led to a new model of damping (spatial hysteresis) which correctly models observed asymptotic behavior in the frequency domain. More recent work focused on transfer function methods for infinite dimensional linear systems. Papers included some remarks on transfer function methods for infinite dimensional linear systems; Spectral and asymptotic properties of linear elastic systems with internal damping; and Frequency/period estimation and adaptive rejection of periodic disturbances. (jhd)

DESCRIPTORS: (U) \*FLEXIBLE STRUCTURES, \*MATHEMATICAL MODELS, ADAPTIVE SYSTEMS, ASYMPTOTIC SERIES, CONTROL SYSTEMS, DAMPING, DISTRIBUTION, ELASTIC PROPERTIES, HYSTERESIS, INTERNAL, LINEAR SYSTEMS, LINEARITY, NONLINEAR SYSTEMS, PARAMETERS, REJECTION, SPATIAL DISTRIBUTION, SPECTRA, TRANSFER FUNCTIONS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A1.

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ABSTRACT: (U) A system, called MATHMODEL was developed by X. Ge in his research at the University of Pennsylvania. It is a very complex and large multi-phase system. It consists of 142 modules and 60,000 lines of PL/1 code. MATHMODEL is based on an old (1984) version of a MODEL system, which automatically translates equational specifications into highly efficient programs in PL/1. Computer Command and Control Company (CCCC) has a much more advanced and reliable version of MODEL that generates programs in several languages (PL/1, C and Ada) and that runs on several computers (IBM and Digital). It also generates programs that can be executed in parallel on distributed computers. Most important, CCCC's MODEL contains many more operations useful in mathematical modelling (e.g. matrix algebra, relational algebra, etc.) This version is much more reliable and robust and is well documented. The project has merged MATHMODEL's capabilities with those of CCCC's MODEL and has transformed MATHMODEL into a greatly more effective tool for mathematical modelling than any system developed to date. (fr)

DESCRIPTORS: (U) \*COMPUTERIZED SIMULATION, \*MATHEMATICAL MODELS, \*COMPUTER PROGRAMMING, DISTRIBUTED DATA PROCESSING, EFFICIENCY, MATRICES(MATHEMATICS), SPECIFICATIONS, PARALLEL PROCESSING, ARTIFICIAL

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INTELLIGENCE.

OKLAHOMA STATE UNIV STILLWATER

IDENTIFIERS: (U) PEG1102F, WUAFOSR3005A1, \*MATHMODEL  
computer program, PL/1 programming language

(U) Electron Redistribution in Mixed Valence Cytochrome  
Oxidase Following Photolysis of Carboxy-Oxidase,

88

PERSONAL AUTHORS: Harmon, H. J.

CONTRACT NO. AFOSR-84-0264

PROJECT NO. 2312

TASK NO. A5

MONITOR: AFOSR  
TR-89-0621

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Bioenergetics and  
Biomembranes, v20 n6 p735-748 1988.

ABSTRACT: (U) The transport of electrons in the oxidase  
is frequently viewed as unidirectional except when energy-  
dependent reverse electron transport occurs. In this  
communication, electron redistribution between redox  
centers in nonliganded mixed valence oxidase will be  
demonstrated. Absorbance changes at 446 nm in purified  
cytochrome oxidase following flash photolysis of carboxy-  
oxidase poised in the mixed valence state at +220 mV show  
biphasic kinetics. One phase corresponds to CO  
recombination to ferrous cytochrome a3 with an energy of  
activation of 9 kcal/mol; the second phase is 3-5 times  
faster with an energy of activation of 9.15 kcal/mol.  
Following flash photolysis at approximately -60 C,  
cytochromes a and c and the 840-nm CUA species are  
observed to undergo reduction as electrons from ferrous  
unliganded cytochrome a3 equilibrate with the  
equipotential redox centers of the oxidase; as CO  
recombines with ferrous cytochrome a3, these centers are  
oxidized and the mixed valence carboxy-oxidase is  
regenerated. Electron redistribution between centers of  
the oxidase in the forward and reverse directions occurs  
faster than does the binding of CO. Keywords: Cytochrome  
oxidase; Carboxy cytochrome oxidase, CO recombination,  
Mixed valence, Cytochrome c, Electron transport. Reprints,  
Copper. (KT)

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ILLINOIS UNIV AT URBANA COORDINATED SCIENCE LAB

DESCRIPTORS: (U) \*CYTOCHROME OXIDASE, \*ELECTRON  
TRANSPORT, ACTIVATION, BLOOD PROTEINS, COPPER,  
DISTRIBUTION, ELECTRONS, FLASHES, ORIENTATION(DIRECTION),  
OXIDATION REDUCTION REACTIONS, PHOTOLYSIS, REPRINTS,  
VALENCE, ABSORPTION, REACTION KINETICS, RECOMBINATION  
REACTIONS.

(U) Solutions to a Class of Nonstandard Stochastic Control  
Problems with Active Learning.

DEC 88

PERSONAL AUTHORS: Basar, Tamer

CONTRACT NO. AFOSR-84-0056

MONITOR: AFOSR  
TR-89-0597

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in IEEE Transactions on  
Automatic Control, v33 n12 p1122-1129 Dec 88.

ABSTRACT: (U) We formulate and solve a dynamic  
stochastic optimization problem of a nonstandard type,  
whose optimal solution features active learning. The  
proof of optimality and the derivation of the  
corresponding control policies is an indirect one, which  
relates the original single-person optimization problem  
to a sequence of nested zero-sum stochastic games.  
Existence of saddle points for these games implies the  
existence of optimal policies for the original stochastic  
control problem, which, in turn, can be obtained from the  
solution of a nonlinear deterministic optimal control  
problem. The paper also studies the problem of existence  
of stationary optimal policies when the time horizon is  
infinite and the objective function is discounted.  
Keywords: Stochastic control, Optimality, Estimation,  
filtering. (sdw)

DESCRIPTORS: (U) \*LEARNING, \*STOCHASTIC CONTROL,  
\*STOCHASTIC PROCESSES, CONTROL, DYNAMICS, OPTIMIZATION,  
POLICIES, SOLUTIONS(GENERAL), STATIONARY.

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AD-A207 736

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BROWN UNIV PROVIDENCE RI LEFSCHETZ CENTER FOR DYNAMICAL SYSTEMS

BROWN UNIV PROVIDENCE RI LEFSCHETZ CENTER FOR DYNAMICAL SYSTEMS

(U) Wavefront Propagation for Reaction-Diffusion Systems of PDE.

(U) Representation of Shift Invariant Operators on  $L_2$  by H at Infinity Transfer Functions: An Elementary Proof, a Generalization to  $L_\infty$  and a Counterexample for  $L_1$  at Infinity.

MAR 89

PERSONAL AUTHORS: Ceremade, G. B.; Evans, L. C.; Souganidis, P. E.; Barles, G.

MAR 89

PERSONAL AUTHORS: Weiss, George

REPORT NO. LCDS/CCS-89-3

REPORT NO. LCDS-CCS-89-5

CONTRACT NO. N00014-83-K-0542, DAAL03-86-K-0074

CONTRACT NO. F49620-86-C-0111

PROJECT NO. 2304

PROJECT NO. 2304

TASK NO. A1

TASK NO. A1

MONITOR: AFOSR

MONITOR: AFOSR

TR-89-C574

TR-89-0573

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Sponsored in part by Grants AFOSR-ISSA-86-0078, NSF-DMS86-01532, NSF-DMS86-01258 and NSF-DMS86-57464. Prepared in cooperation with Maryland Univ., College Park and Paris-9 Univ. (France).

ABSTRACT: (U) An elementary proof is given of the well known fact that shift invariant operators on  $(L_\infty)^0$ , infinity are represented by transfer functions which are bounded and analytic on the right open half-plane. Proved is a generalization to Banach space-valued  $L_\infty$  superscript  $p$  functions, where  $1 < p < \infty$ . The result no longer holds for  $p = \infty$ . (JHD)

ABSTRACT: (U) The theory of viscosity solutions for Hamilton-Jacobi equations is used to study the asymptotic behavior of solutions to certain systems of reaction-diffusion PDE. Our principal result characterizes the region of convergence of the solution to an unstable rest point as the set where the solution of an appropriate Hamilton-Jacobi equation is positive. Keywords: Partial Differential equations; Wave front propagation. (jhd)

DESCRIPTORS: (U) TRANSFER FUNCTIONS. OPERATOR(MATHEMATICS).

IDENTIFIERS: (U) PE61102F, WJAFOSR2304A1, infinity transfer functions.

DESCRIPTORS: (U) \*PARTIAL DIFFERENTIAL EQUATIONS, \*WAVE PROPAGATION, \*WAVEFRONTS, ASYMPTOTIC SERIES, SOLUTIONS(GENERAL), THEORY, VISCOSITY.

IDENTIFIERS: (U) Hamilton Jacobi equations.

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## DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI32L

AD-A207 725 12/4

AD-A207 724 12/2

RUTGERS - THE STATE UNIV NEW BRUNSWICK N J

MARYLAND UNIV COLLEGE PARK

(U) Regulation of Nonlinear and Generalized Linear Systems.

(U) Theoretical Investigations of Chaotic Dynamics.

DESCRIPTIVE NOTE: Final rept 15 Jul 85-14 Jul 88.

DESCRIPTIVE NOTE: Final rept. 1 Dec 86-30 Nov 88.

SEP 88

NOV 38

PERSONAL AUTHORS: Sontag, Eduardo D.

PERSONAL AUTHORS: Yorke, James

CONTRACT NO. AFOSR-85-0247

CONTRACT NO. AFOSR-87-0110

PROJECT NO. 2304

PROJECT NO. 2304

TASK NO. A1

TASK NO. A1

MONITOR: AFOSR  
TR-89-0529MONITOR: AFOSR  
TR-89-0572

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) Research during the grant period can be classified into these areas: Equilinearization, Sampling and Discrete Time Controllability, Input/Output Equations, Input/Output Stability, Families of Systems, Image Processing and Robotics, Nonlinear Stabilization, Computational Complexity in Control, and Neural Networks and Piecewise Linear Control. The report describes the progress achieved in each of these.

ABSTRACT: (U) Ten papers have been published: Pseudo-orbit shadowing in the family of tent maps; Is every approximate trajectory of some process near an exact trajectory of a nearby process? Noise reduction in dynamical systems; Using dynamic embedding methods to analyze experimental data; Period halving for  $x$  sub  $H+1$  MF (sub N) where F has negative Schwarzian derivative; Numerical orbits of chaotic processes represent true orbits; A procedure for finding numerical trajectories on chaotic saddles; Antimonotonicity; Concurrent creation and annihilation of periodic orbits; Accessible saddles on fractal basin boundaries. Analysis of a procedure for finding numerical trajectories close to chaotic saddle hyperbolic sets. (jhd)

DESCRIPTORS: (U) \*OPERATIONS RESEARCH, \*LINEAR SYSTEMS, \*NONLINEAR SYSTEMS, COMPUTATIONS, CONTROL, EQUATIONS, IMAGE PROCESSING, INPUT OUTPUT PROCESSING, NEURAL NETS, ROBOTICS, SAMPLING, STABILITY, STABILIZATION, LINEARITY, TIME.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2304A1.

DESCRIPTORS: (U) \*MATHEMATICAL ANALYSIS.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2304A4, \*Chaos.

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## DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI32L

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AD-A207 715 20/11 8/5 20/4

JOHNS HOPKINS UNIV BALTIMORE MD DEPT OF MATHEMATICAL SCIENCES

CALIFORNIA UNIV BERKELEY

(U) Large Scale Function Minimization.

(U) Nonlinear Stability in Fluid and Plasma Dynamics.

DESCRIPTIVE NOTE: Final scientific rept. 15 Jul 85-14 Oct 88.

DESCRIPTIVE NOTE: Final technical rept.,

FEB 89

OCT 88

PERSONAL AUTHORS: Marsden, Jerrold E.

PERSONAL AUTHORS: Nash, Stephen G.

CONTRACT NO. F49620-87-C-0118

CONTRACT NO. AFOSR-85-0222

PROJECT NO. 2304

PROJECT NO. 2304

TASK NO. A9

TASK NO. A8

MONITOR: AFOSR

MONITOR: AFOSR  
TR-89-0532

TR-89-0533

UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) Several new optimization techniques suitable for parallel computers have been developed and have been tested on an Intel hypercube. On a number of nonlinear problems, the algorithms tested have demonstrated dramatic speed-ups over their sequential counterparts. The fact that these speedups are better than can be attributed to parallelism done suggest that they may lead to improved sequential methods.

DESCRIPTORS: (U) \*FUNCTIONS, \*NONLINEAR SYSTEMS, \*PARALLEL ORIENTATION, ALGORITHMS, COMPUTERS, OPTIMIZATION, SEQUENTIAL ANALYSIS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A8, Newton method.

ABSTRACT: (U) This report presents a block diagonalization theorem which is designed to study the stability and bifurcation of rotating systems, or more generally, of relative equilibria. The context of the discussion is the energy-momentum method of mechanical systems with symmetry. Crucial special cases of the block diagonalization theorem for uniformly rotating system, including general nonlinear elasticity and geometrically exact rods. The purpose here is to abstract these examples and prove a general geometric theorem. These general results will be important for rotating gravitational fluid masses as well. (jhd)

DESCRIPTORS: (U) \*ELASTIC PROPERTIES, \*MECHANICAL COMPONENTS, \*ROTATION, DYNAMICS, GEOMETRY, NONLINEAR SYSTEMS, PLASMAS(PHYSICS), RODS, STABILITY, THEOREMS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A9, Block diagonalization theorem.

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AD-A207 624 7/3 7/6

WASHINGTON STATE UNIV PULLMAN

CALIFORNIA STATE UNIV SACRAMENTO DEPT OF CHEMISTRY

(U) Rapidly Convergent Algorithms for Nonsmooth Optimization.

(U) Synthesis of Primary-Alcohol-Terminated Polyepichlorohydrin with Molecular Weight of 4000 to 12000.

DESCRIPTIVE NOTE: Final scientific rept. 15 Jul 83-14 Jun 88.

DESCRIPTIVE NOTE: Final technical rept. 1 Jun 87-31 Jan 89.

DEC 88

PERSONAL AUTHORS: Mifflin, Robert

MAR 89

CONTRACT NO. AFOSR-83-0210

PERSONAL AUTHORS: Kim, C. S.; Fish, Richard; Curb, Phil; Youn, Chung; Kho, Lily

PROJECT NO. 2304

CONTRACT NO. AFOSR-87-223

TASK NO. A\*

PROJECT NO. 2303

MONITOR: AFOSR

TASK NO. B2

TR-89-0592

MONITOR: AFOSR

TR-89-0477

UNCLASSIFIED REPORT

ABSTRACT: (U) The research supported by this grant has continued the development of efficient methods for solving optimization problems involving implicitly defined functions that are not everywhere differentiable. Research on a rapidly convergent algorithm for the constrained single variable case where generalized derivatives are known has been completed. Significant process has been made in extending this work to the n-variable case via the definition of better than linear convergence. Safeguarding techniques have been developed which ensure first order convergence on problems with semismooth functions, but do not prevent better than linear convergence on piecewise second order smooth functions. For the constrained case a scale-free automatic penalty technique has been devised. A new stable method for solving certain quadratic programming problems has been developed which includes a technique for resolving degeneracy. (UHD)

DESCRIPTORS: (U) \*ALGORITHMS, \*CONVERGENCE, \*OPTIMIZATION, EFFICIENCY, FUNCTIONS, PROBLEM SOLVING, QUADRATIC PROGRAMMING, STABILITY, VARIABLES.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A1, \*Nonsmooth optimization.

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UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Prepared in cooperation with Hornet Foundation, Inc., Sacramento, CA, Rept. No. 2692.

ABSTRACT: (U) Previous studies of cationic polymerization of epichlorohydrin (ECH) indicate that the commonly used initiator systems, Lewis acid alcohol or tertiary oxonium salt alcohol complexes give polyepichlorohydrin (PECH) whose average molecular weight is less than 4000 and the terminal groups are sterically hindered secondary alcohols. In our study, a novel pseudoliving polymerization system of epichlorohydrin has been developed, using 1,4-butaneditrificate (BDT) as the initiator. The advantages of BDT as the initiator are: (1) There are no head groups on the polymeric chains because BDT is difunctional, and (2) the tail groups (triflate esters) of the polymeric chains can be converted to a variety of functional groups. Our experimental results demonstrate that telechelic PECH having molecular weights in the range of 4000 - 15000 and with different functional groups can be synthesized. For example, the end-groups of PECH can be phenoxide groups or 1-hydroxybutyl groups; these have been characterized by UV, FTIR and NMR studies. Furthermore, PECH with different

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alcohol structures and the functionalities of two and four have been synthesized. Telechelic polymerization. Epichlorohydrin, Initiator, Molecular weight, 1,4-Butaneditrificate, Kinetic studies, End groups. (mjm)

VIRGINIA POLYTECHNIC INST AND STATE UNIV BLACKSBURG MATERIALS RESPONSE GROUP

(U) Investigation and Modeling of Damage Growth in Composite Laminates.

DESCRIPTORS: (U) \*ALCOHOLS, \*POLYMERS, \*CHLORINE COMPOUNDS, ACIDS, CATIONS, CHAINS, ESTERS, KINETICS, MOLECULAR WEIGHT, POLYMERIZATION, SECONDARY, STRUCTURES, TAIL ASSEMBLIES.

DESCRIPTIVE NOTE: Final rept. 1 Jan-31 Dec 88.

SCP 88

IDENTIFIERS: (U) PE61102F. WUAFOSR2303B2, epichlorohydrin/poly.

PERSONAL AUTHORS: Reifsnider, K. L.; Stinchcomb, W. W.; Bakis, C. E.; Yih, H. R.; Shalev, Doron

CONTRACT NO. AFOSR-85-0087

PROJECT NO. 2302

TASK NO. 82

MONITOR: AFOSR  
TR-88-1253

UNCLASSIFIED REPORT

ABSTRACT: (U) Damage initiation and growth has been studied in several material systems and two notched geometries, revealing generic characteristics of damage development and its relationship to microstructure. Stress redistribution has been studied with photoelastic methods and simulated analytically. Adiabatic thermoelastic methods for strain field analysis under dynamic loading have been developed and the first micromechanical formulation of that problem has been achieved. A formulation of the singular stress problem in the boundary layer near a hole in composite laminates has been completed. And a brief study of the applicability of chaos theory to damage development representation was conducted. A critical element model of remaining strength and life of notched laminates has been constructed and validated.

DESCRIPTORS: (U) \*COMPOSITE MATERIALS, \*LAMINATES, ADIABATIC CONDITIONS, BOUNDARY LAYER, DAMAGE, DISTRIBUTION, DYNAMIC LOADS, GROWTH(GENERAL), MICROSTRUCTURE, MODELS, PHOTOELASTICITY, STRESSES, THERMOELASTICITY.

IDENTIFIERS: (U) PE61102F. WUAFOSR2302B2.

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AD-A207 610 12/4

AD-A207 405 7/2

WISCONSIN UNIV-MADISON

TEXAS TECH UNIV LUBBOCK DEPT OF CHEMISTRY

(U) Computation and Theory in Nonlinear Optimization.

(U) Intermolecular Potential Energy Function, Second Virial Coefficients, and Oligomer Properties of Hydrogen Fluoride.

DESCRIPTIVE NOTE: Final rept. 15 Jan-14 Nov 88.

NOV 88

NOV 81

PERSONAL AUTHORS: Papadopoulos, Gregory M.

PERSONAL AUTHORS: Redington, Richard L.

CONTRACT NO. AFOSR--88-0090

PROJECT NO. 2303

PROJECT NO. 2304

TASK NO. D9

TASK NO. A

MONITOR: AFOSR  
TR-89-0481

MONITOR: AFOSR  
TR-89-0534

UNCLASSIFIED REPORT

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ABSTRACT: (U) Researchers have made substantial progress in the decomposition of large-scale nonlinear problems for accelerated convergence. A Newton method for nonsmooth equations has been developed and conditions for its convergence determined. The original proposal suggested work in the general area of large-scale optimization: in particular, methods for decomposition based on the so-called Bundle method, decomposition of large-scale nonlinear problems, including parameter optimization in networks of queues, and accelerating the convergence of bundle-type methods, including developing the theory base in areas such as implementable second-order models of functions to be optimized. A particular area of work suggested as a major topic of investigation was the development of a computationally implementable and efficient Newton-type algorithm for nonsmooth problems. (jhd)

DESCRIPTORS: (U) \*NONLINEAR ANALYSIS, \*OPTIMIZATION, BUNDLES, CONVERGENCE, DECOMPOSITION, NETWORKS, PARAMETERS, QUEUEING THEORY, THEORY, COMPUTATIONS.

IDENTIFIERS: (U) WUAFOSR2304A8, PE61102F.

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SUPPLEMENTARY NOTE: Pub. in Jnl. of Chemical Physics, v75 n9 p4417-4421, 1 Nov 81.

ABSTRACT: (U) Six recently intermolecular potential energy functions for HF-HF interactions are examined and used to calculate classical second virial coefficients curves. Order of magnitude differences exist among the six B(T) curves and none of them decreases with temperature as rapidly as an experimental curve determined in the 19.5-56 C range. The HF3 potential of Klein, McDonald, and O'Shea appears to give the best overall description of HF-HF interactions and this function is used to calculate properties of several higher (HF) oligomers. The resulting low energy conformations are cyclic, and the hexamer has a puckered, nonrigid structure. The calculated hydrogen bond energies, F...F distances, and the puckered, nonrigid hexamer structure all agree well with the available experimental information. Reprints. (jes)

DESCRIPTORS: (U) \*CHEMICAL BONDS, \*MOLECULE MOLECULE INTERACTIONS, ENERGY, EXPERIMENTAL DATA, FUNCTIONS, GRAPHS, HYDROGEN BONDS, HYDROGEN FLUORIDE, LOW ENERGY, POLYMERS, POTENTIAL ENERGY, REPRINTS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303D9.

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## DTIC REPORT BIBLIOGRAPHY

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AD-A207 266 12/1

STATE UNIV OF NEW YORK AT BUFFALO DEPT OF CHEMISTRY

KENT STATE UNIV OH DEPT OF MATHEMATICAL SCIENCES

(U) Surface Plasmon Study of Monolayer-Bilayer Transition  
in Poly-4-BCMU and Poly-3-BCMU Polydiacetylene  
Langmuir-Blodgett Films.

89

PERSONAL AUTHORS: Huang, X.; Burzynski, R.; Prasad, P. N.

CONTRACT NO. F49620-87-C-0042

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-89-0471

## UNCLASSIFIED REPORT

ABSTRACT: (U) Surface plasmon wave spectroscopy was successfully used to study the monolayer-bilayer transition in poly-4-BCMU and poly-3-BCMU polydiacetylene Langmuir-Blodgett films. The linear refractive index and the thickness were obtained for the monolayer yellow and bilayer red forms of poly-4-BCMU. Surface plasmon coupling using resonance enhancement was found to sufficiently enhance the Raman scattering, so Raman spectra of the monolayer films could be obtained with a relatively small laser intensity of a few milliwatts. The differences in the (doubles bond)c and (triple bond)c vibrational stretching frequencies of the monolayer yellow and the bilayer films were observed arising from the difference in the effective conjugation of the two forms. Electrochemistry; Plasmon waves; Reprints. (jhd)

DESCRIPTORS: (U) \*ELECTROCHEMISTRY, \*ACETYLENES, \*PLASMONS, BONDING, COUPLING(INTERACTION), FILMS, INTENSITY, LASERS, LAYERS, LIGHT SCATTERING, OPTIMIZATION, RAMAN SPECTRA, REFRACTIVE INDEX, REPRINTS, RESONANCE, SPECTROSCOPY, THICKNESS, RED(COLOR), YELLOW(COLOR).

IDENTIFIERS: (U) Acetylene/Poly-3-BCMU polydi, Acetylene/Poly-4-BCMU polydi, Langmuir Blodgett films.

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DESCRIPTIVE NOTE: Final rept. 1 Oct 79-30 Jun 80.

AUG 80

PERSONAL AUTHORS: Varga, R. S.

CONTRACT NO. F49620-79-C-0175

PROJECT NO. 2304

TASK NO. A3

MONITOR: AFOSR  
TR-89-0514

## UNCLASSIFIED REPORT

ABSTRACT: (U) This research conducted by the principal investigator during the period October 1, 1979 to June 30, 1980, resulted in the following research articles which have either appeared in print, or have been accepted in refereed mathematical journals, in this period:  
Inequalities for polynomials with a prescribed zero;  
Theorems of Stein-Rosenberg Type; On the Enestrom-Kakeya Theorem and Its Sharpness; Bounds for incomplete polynomials vanishing at both endpoints of an interval;  
Hermite-Birkhoff interpolation in the n-th roots of unity;  
Remarks on some conjectures of G.G. Lorentz; On incomplete polynomials. II; Interpolation in the roots of unity; an extension of a Theorem of J. L. Walsh; On the sharpness of some upper bounds for spectral radii of S.O. R. iteration matrices; An extension of the Enestrom-Kakeya Theorem and its sharpness; Lacunary trigonometric interpolation on equidistant nodes. Keywords:  
Bibliographies. (kr)

DESCRIPTORS: (U) \*INTERPOLATION, \*ITERATIONS, \*POLYNOMIALS, BIBLIOGRAPHIES, LINEAR ALGEBRAIC EQUATIONS, MATHEMATICS, PERIODICALS, TRIGONOMETRY.

IDENTIFIERS: (U) WUAFOSR2304A3, PE61102F.

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NORTH CAROLINA STATE UNIV AT RALEIGH DEPT OF MATERIALS  
SCIENCE AND ENGINEERING

LA JOLLA INST CA

(U) Low-Energy Atomic Collisions.

(U) Molecular Beam Epitaxial Growth of  $Hg(1-x)Cd_xTe$ .DESCRIPTIVE NOTE: Final rept.,  
DESCRIPTIVE NOTE: Final scientific rept. 1 Jun-30 Sep 80.

OCT 80

JUN 80

PERSONAL AUTHORS: Moazed, K. L.

PERSONAL AUTHORS: Neynaber, R. H.; Tang, S. Y.

CONTRACT NO. AFOSR-78-3721

CONTRACT NO. AFOSR-80-0244

PROJECT NO. 2306

PROJECT NO. 2301

TASK NO. C2

TASK NO. A4

MONITOR: AFOSR  
TR-89-0492MONITOR: AFOSR  
TR-89-0504

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) The 11-VI compound  $Hg_{1-x}Cd_xTe$  is a material of considerable interest as a semi-conductor for optical devices, particularly in the infrared spectral regions. Solid solutions appear to exist for all values of  $x$ , and for values of  $x$  between about 0.2 and 1.0 the material behaves as a semiconductor with a variable bandgap between 0.05 eV ( $x=0.2$ ) and 1.53 eV ( $x=1$ ) at room temperature. Mercury Cadmium Tellurides. (MJM)

DESCRIPTORS: (U) \*CADMIUM TELLURIDES, \*EPITAXIAL GROWTH, \*MERCURY COMPOUNDS, INFRARED SPECTRA, MOLECULAR BEAMS, OPTICAL EQUIPMENT, SOLID SOLUTIONS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2306C2, mercury cadmium tellurides.

ABSTRACT: (U) A description of charge-transfer studies of  $HCl^+$  in Xe using a merging beams technique is given. Absolute and relative cross sections were obtained for collision energies from 0.01 to 870 eV. The goal of this experimental program was to study selected chemi-ionization and ion-molecule reactions by merging-beams techniques to better understand the dynamics of such collisions and to provide data to assist in the formulation of theory. The relative energy of the reactants for these studies was varied from threshold to 10 or 20 eV. These studies give a clearer picture of the role played by the kinetic and internal energy of reactants at low relative energies. This is important for the development of advanced Air Force systems that require communication through either a naturally or artificially ionized atmosphere, for the development of propulsion systems for the Air Force, and for advancing the technology of lasers. (jhd)

DESCRIPTORS: (U) \*CHARGE TRANSFER, \*COLLISIONS, \*HYDROGEN CHLORIDE, \*XENON, AIR FORCE, ATMOSPHERES, ATOMS, CHEMICAL REACTIONS, CROSS SECTIONS, DYNAMICS, ENERGY, FORMULATIONS, INTERNAL, IONIZATION, IONS, KINETIC ENERGY, LASERS, LOW ENERGY, MOLECULES, PARTICLE COLLISIONS, PICTURES, PROPULSION SYSTEMS, THEORY.

IDENTIFIERS: (U) PE61102F, WUAFOSR2301A4.

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AD-A207 188 CONTINUED

FLORIDA INST OF TECH MELBOURNE DEPT OF ELECTRICAL AND  
COMPUTER ENGINEERING

AD-A207 188 6/7 6/1 20/15

(U) Investigation of Radio Frequency/Microwave Effects  
Upon the Central Nervous System.

FREQUENCIES, CENTRAL NERVOUS SYSTEM, CEREBRUM,  
ELECTROMAGNETIC PULSES, PHYSIOLOGY, PULSE RATE,  
RADIOACTIVITY, RADIOFREQUENCY, SKULL, SOLUTIONS(GENERAL),  
STATISTICS, TISSUES(BIOLOGY), WHOLE BODY IRRADIATION,  
NEUROCHEMISTRY.

DESCRIPTIVE NOTE: Final rept..

IDENTIFIERS: (U) WUAFOSR2312D9, PE61102F.

JUN 80

PERSONAL AUTHORS: Shelton, W. W.

CONTRACT NO. AFOSR-79-0110

PROJECT NO. 2312

TASK NO. D9

MONITOR: AFOSR  
TR-89-0519

UNCLASSIFIED REPORT

ABSTRACT: (U) A study to determine the effect of pulsed electromagnetic energy upon brain calcium behavior was undertaken. An innovative approach for loading the cerebral tissues with radiocalcium was introduced. Intraventricular injections through the skull placed Ca-45 solution directly into the right lateral ventricle. Two hours later companion frontal lobe samples were placed in separate glass breakers containing physiologic solution for a 20 min exposure to pulsed electromagnetic energy. An efflux value was calculated for each sample. A second experimental procedure involved whole-body irradiation of the animals two hours following the intraventricular injections. Animals were then irradiated with pulsed electromagnetic energy at a power density of 10 mW/cm squared, a pulse repetition frequency of 16 Hz, and carrier frequency of 2.45 GHz. Following exposure, frontal lobe and parieto-occipital tissue samples were taken and analysed for radioactivity. Statistical treatment of the first sets of experiments failed to reveal any perturbation in calcium efflux behavior. Data from the second set is still being evaluated. Keywords: Radiation effects. (kt)

DESCRIPTORS: (U) \*CALCIUM, \*ELECTROMAGNETIC RADIATION,  
\*MICROWAVES, \*RADIATION EFFECTS, ANIMALS, BRAIN, CARRIER

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RENSELAEER POLYTECHNIC INST TROY NY DEPT OF MATHEMATICAL SCIENCES

CALIFORNIA UNIV SAN DIEGO LA JOLLA DEPT OF APPLIED MECHANICS AND ENGINEERING SCIENCES

(U) Numerical Methods for Singularly Perturbed Differential Equations with Applications.

(U) Fundamental Combustion Studies Related to Air-Breathing Propulsion.

DESCRIPTIVE NOTE: Final rept..

DESCRIPTIVE NOTE: Final rept. 1 Jul 77-1 Jun 81.

MAY 80

SEP 81

PERSONAL AUTHORS: Flaherty, Joseph E.

PERSONAL AUTHORS: Williams, F. A.

CONTRACT NO. AFOSR-75-2818

CONTRACT NO. AFOSR-77-3362

PROJECT NO. 2304

PROJECT NO. 2308

TASK NO. A3

TASK NO. A2

MONITOR: AFOSR

MONITOR: AFOSR

TR-89-0520

TR-89-0497

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) During the course of this grant algorithms were developed and analyzed for the numerical solution of singularly-perturbed (or stiff) initial value and boundary value problems for ordinary differential equations and initial-boundary value problems for partial differential equations. These general purpose methods have been applied to a wide variety of problems arising in several disciplines, including optimization and optimal control, nonlinear oscillations, chemical reactions, and hydrodynamic stability. Keywords: Computations, Plane poiseuille flow, Viscous flow. (kr)

ABSTRACT: (U) The overall objective has been to develop further basic knowledge in combustion that will be useful for improving efficiencies and operating characteristics of propulsion system. Insufficient understanding of the basic mechanisms and processes involved in advanced air breathing combustors, lack of realistic guidelines for predicting characteristics of propulsion devices and of external burning, and a deficiency in methods of combustor design with acceptable pollutant emissions motivated the initiation of this research on advancing understanding of the combustion of fuels in air. (MJM)

DESCRIPTORS: (U) \*PERTURBATION THEORY, \*VISCOUS FLOW, BOUNDARY VALUE PROBLEMS, CHEMICAL REACTIONS, COMPUTATIONS, CONTROL, DIFFERENTIAL EQUATIONS, HYDRODYNAMICS, NONLINEAR SYSTEMS, NUMERICAL METHODS AND PROCEDURES, OPTIMIZATION, OSCILLATION, PARTIAL DIFFERENTIAL EQUATIONS, STABILITY.

DESCRIPTORS: (U) \*AIR BREATHING ENGINES(UNCONVENTIONAL), \*COMBUSTION, \*PROPELLSION SYSTEMS, AIR BREATHING, COMBUSTORS, EMISSION, FUELS, POLLUTANTS.

IDENTIFIERS: (U) WUAFOSR2304A3, PE61102F, \*Poiseuille flow, Initial value problems.

IDENTIFIERS: (U) WUAFOSR2308A2, PE61102F.

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BOSTON UNIV MA

PENNSYLVANIA STATE UNIV UNIVERSITY PARK DEPT OF MATERIALS SCIENCE AND ENGINEE RING

(U) Fluorescence Probes of Spectroscopic and Dynamical Aspects of Molecular Photoionization

(U) High Temperature Oxidation Studies on Alloys Containing Dispersed Phase Particles and Clarification of the Mechanism of Growth of SiO<sub>2</sub>.

DESCRIPTIVE NOTE: Final rept. 1 Jul 84-30 Jun 88,

NOV 88

DESCRIPTIVE NOTE: Final rept. 15 Aug 85-31 Dec 88,

PERSONAL AUTHORS: Poliakoff, Erwin D.

FEB 89 29P

CONTRACT NO. AFOSR-84-0261

PERSONAL AUTHORS: Yan, R.; Munn, B.; Simkovich, G.

PROJECT NO. 2301

CONTRACT NO. AFOSR-85-0298

TASK NO. A4

PROJECT NO. 2306

MONITOR: AFOSR TR-89-0473

MONITOR: AFOSR TR-89-0392

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) Studies have been made of vibrationally resolved aspects of shape resonant excitation in the photoionization of N(2)O. This experiment was performed by generating dispersed fluorescence spectra from electronically excited photoions. These results are the first vibrationally resolved results on a polyatomic shape resonance. In vibrationally resolved measurements, different internuclear configurations are probed by sampling alternative vibrational levels of the ion. As a result, the continuum electron behavior can be mapped out most clearly, and the qualitative aspects of the electron ejection can be understood clearly. A central motivation for studying polyatomic shape resonances is that alternative vibrational modes may be explored, revealing facets that are nonexistent for diatomic systems, which are the only systems that have been characterized previously. Nitrogen oxides. (MUM)

DESCRIPTORS: (U) \*NITROGEN OXIDES, \*PHOTOIONIZATION, APES, BEHAVIOR, DIATOMIC MOLECULES, DISPERSING, EJECTION, ELECTRONS, EXCITATION, FLUORESCENCE, MOLECULES, MOTIVATION, POLYATOMIC MOLECULES, PROBES, RESONANCE, SAMPLING, SHAPE, SPECTRA, VIBRATION.

IDENTIFIERS: (U) WUAFOSR2301A4, PE61102F.

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ABSTRACT: (U) In most binary transition metal alloys, additions of Cr are used to promote the formation of a protective Cr<sub>2</sub>O<sub>3</sub> layer. Once formed, this layer acts as a barrier between the metal and its environment and, thereby, prolongs service life of the alloy. The ability to form such a layer depends upon a complex interaction of variables; the most influential being the concentration of Cr present in the alloy. In fact, there is a critical concentration of Cr, below which a complete, protective Cr<sub>2</sub>O<sub>3</sub> scale will not form. Under the severe conditions employed in this investigation, upwards of 18 weight percent Cr is required to form a protective layer in the binary Ni-Cr and Fe-Cr alloys. (JES)

DESCRIPTORS: (U) \*BINARY ALLOYS, \*OXIDATION, \*TRANSITION METALS, ADVERSE CONDITIONS, CHROMIUM ALLOYS, DISPERSIONS, HIGH TEMPERATURE, INTERACTIONS, IRON ALLOYS, LAYERS, LIFE EXPECTANCY(SERVICE LIFE), NICKEL ALLOYS, PARTICLES, SILICON DIOXIDE, VARIABLES.

IDENTIFIERS: (U) PE61102F, WUAFOSR2306A2.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI32L

AD-A207 140 7/4 20/5

AD-A207 140 CONTINUED

STATE UNIV OF NEW YORK AT BUFFALO DEPT OF CHEMISTRY

(U) Raman Study of Solid State Reactions.

DESCRIPTIVE NOTE: Final rept. 1 Sep 79-31 Aug 80,

AUG 80 11P

PERSONAL AUTHORS: Prasad, Paras N.

CONTRACT NO. F49620-79-C-0229

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-89-0503

UNCLASSIFIED REPORT

**ABSTRACT:** (U) The mechanisms and the reaction dynamics of several solid state reactions were investigated. The thermal rearrangement reaction of methyl-p-dimethylaminobenzene sulfonate (MSE) in pure crystal to form the product p-trimethylammonium benzene sulfonate Zwitterion (ZWT) was investigated during this period. Detailed studies of the phonon spectra as well as the internal vibration spectra were made as a function of the percentage rearrangement using polycrystalline samples as well as single crystals in different orientations. Solid state photodimerization of two modifications of trans-cinnamic acids in pure crystal was investigated. Also, the topotactic transformation reaction of iodobenzoyl peroxide was investigated. This reaction is thermally enhanced and yields a number of products. An important aspect of a dynamical model is to determine specificity in phonon induction of solid state reactions. In order that a large population of selective and coherent vibrational excitation can be achieved to study its effect on reactivity it is necessary that vibrational relaxation be slow. The dephasing of a localized internal vibration of the naphthalene crystal was investigated by studying the temperature dependence of the line width, the line shape and the line frequency. (AM)

**DESCRIPTORS:** (U) \*SOLID STATE CHEMISTRY, \*VIBRATIONAL SPECTRA, \*CHEMICAL REACTIONS, \*ORGANIC COMPOUNDS.

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COHERENCE, CRYSTALS, DYNAMICS, EXCITATION, FREQUENCY, INTERNAL, LINE SPECTRA, MODELS, MODIFICATION, PHONONS, POLYCRYSTALLINE, POPULATION, PURITY, RAMAN SPECTRA, REACTION KINETICS, REACTIVITIES, RELAXATION, RESPONSE, SAMPLING, SHAPE, SINGLE CRYSTALS, VIBRATION, WIDTH, THERMOCHEMISTRY, PHOTOCHEMICAL REACTIONS, DIMERS, SULFONATES, BENZENE, AMINES, METHYL RADICALS, AMMONIUM COMPOUNDS, NAPHTHALENES, PEROXIDES, RAMAN SPECTROSCOPY.

**IDENTIFIERS:** (U) PE81102F, WUAFOSR2303A3, Sulfonate/methyl-p-dimethylaminobenzene, Zwitterion, Photodimerization, Cinnamic acids, Peroxide/Iodobenzoyl.

UNCLASSIFIED

OTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVI32L

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NATIONAL BUREAU OF STANDARDS GAITHERSBURG MD  
THERMODYNAMICS DIV

PITTSBURGH UNIV PA DEPT OF CHEMISTRY

(U) Thermodynamics of High Temperature Materials.

(U) Measurement of Rate Constants of Elementary Gas Reactions of Importance to Upper Atmosphere and Combustion Systems.

DESCRIPTIVE NOTE: Final rept. 1 Oct 78-30 Sep 79.

DESCRIPTIVE NOTE: Final rept. 1 Jul 79-31 Aug 80.

SEP 79 14P

AUG 80 9P

PERSONAL AUTHORS: Abramowitz, Stanley

PERSONAL AUTHORS: Kaufman, Frederick

CONTRACT NO. AFOSR-79-0012

CONTRACT NO. F49620-79-C-0155

PROJECT NO. 2308

PROJECT NO. 2303

TASK NO. B1

TASK NO. B1

MONITOR: AFOSR

TR-89-0506

MONITOR: AFOSR

TR-89-0505

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) Heat capacity, electrical resistivity, total hemispherical emittance of carbon composite (supplied by AFML), and palladium, radiance temperature at melting point of palladium, heat of fusion of niobium measured. Electrical system of pulse interferometer for thermal expansion and system for thermal diffusivity completed. Enthalpy measurements to 1200 K on Silicon nitride made. Analysis of silicon carbide completed and enthalpy measurements made to 770 K. Computer codes for direct sum technique to assess effect of vibrational thermodynamic functions completed and tested. Vibrational assessments for two silicon fluoride bromide species completed. Direct sum programs for thermodynamic functions for several Hund's coupling cases completed. (JES)

DESCRIPTORS: (U) \*THERMODYNAMICS, CARBON, COMPUTER PROGRAMS, COUPLING(INTERACTION), DIFFUSIVITY, ELECTRICAL EQUIPMENT, ELECTRICAL RESISTANCE, EMITTANCE, ENTHALPY, FUNCTIONS, HEMISPHERES, HIGH TEMPERATURE, INTERFEROMETERS, MATERIALS, MEASUREMENT, MELTING POINT, NIOBIUM, PALLADIUM, PULSES, RADIANCE, SILICON CARBIDES, SILICON NITRIDES, SPECIFIC HEAT, TEMPERATURE, TEST AND EVALUATION, THERMAL EXPANSION, THERMAL PROPERTIES, VIBRATION.

IDENTIFIERS: (U) PE61102F, WUAFOSR2308B1.

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ABSTRACT: (U) Fortunately, a parallel research investigation on collisional relaxation of highly excited hydrogen chloride and hydrogen fluoride, formerly supported by the Advanced Research Projects administration, and a great scientific research and development interest to AFOSR was able to be continued with modest support from this contract and has provided valuable information on relaxation rate measurements for HCl ( $v=1$  to 7) colliding with a large number of other molecules and some preliminary rate measurements for HF ( $v=1$  to 7). The present report will therefore be subdivided into two sections dealing with these two topics, but it must be kept in mind that this is essentially a progress report covering the initial 14-months building up period of a major project. (mjm)

DESCRIPTORS: (U) \*GASES, \*HYDROGEN CHLORIDE, \*HYDROGEN FLUORIDE, \*CHEMICAL REACTIONS, COMBUSTION, CONSTANTS, MEASUREMENT, MOLECULES, RATES, RELAXATION, UPPER ATMOSPHERE.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B1.

## UNCLASSIFIED

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BRIGHAM YOUNG UNIV PROVO UTAH DEPT OF MICROBIOLOGY

(U) Effect of Chemical Mutagens on Herpes Virus - Induced Cellular Transformation and Testing for Mutagenesis in Mouse Cells.

TEMPERATURE, TEST AND EVALUATION, TEST EQUIPMENT, TEST METHODS, TRANSFORMATIONS, VIRUS DISEASES, VIRUSES.  
IDENTIFIERS: (U) PE61102F, WUAFOSR2312A5.

DESCRIPTIVE NOTE: Final rept. 1 Jun 79-31 May 80.

MAY 80 14P

PERSONAL AUTHORS: Johnson, F. B.

CONTRACT NO. F49620-79-C-0116

PROJECT NO. 2312

TASK NO. A5

MONITOR: AFOSR  
TR-89-0522

## UNCLASSIFIED REPORT

ABSTRACT: (U) Assays which detect quantitative increases of morphological transformation in 3T3 cells were employed to detect transformation by seven temperature sensitive mutants of herpes simplex type 2 virus. It was determined that all seven mutants caused transformation at the non-permissive temperature. Mutant A8 (293) caused formation of the most foci and appeared to be a more sensitive indicator of transformation in comparative experiments (31 foci per million cells compared to four foci per million cells for ultraviolet-irradiated wild type virus). Mutagenesis experiments using THO cells as indicator cells suggested that even after metabolic activation of the test chemicals this cell system does not provide an adequately sensitive test for mutagenesis. In additional experiments, further information was obtained which showed enhancement of transformation by hydrazine and 1,2-dimethylhydrazine of cells exposed to irradiated virus. Significant enhancement occurred in these in vitro tests only when the cells were exposed to the chemical 24 hours prior to virus infection. (kt/aw)

DESCRIPTORS: (U) \*HERPESIC VIRUSES, \*PHYSIOLOGICAL EFFECTS, \*MUTAGENS, \*MUTATIONS, ACTIVATION, CELLS(BIOLOGY), CHEMICALS, HYDRAZINES, IN VITRO ANALYSIS, INDICATORS, IRRADIATION, METABOLISM, MICE, MORPHOLOGY, SENSITIVITY.

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BATTELLE MEMORIAL INST COLUMBUS OH COLUMBUS LABS

KANSAS UNIV LAWRENCE

(U) Kinetics of Ni(CO)<sub>4</sub> Formation.

(U) Demodulation Processes in Auditory Perception.

DESCRIPTIVE NOTE: Final rept. 1 Oct 76-30 Sep 80.

DESCRIPTIVE NOTE: Final rept. 1 Dec 87-30 Nov 88, annual rept. 1 Dec 87-30 Nov 88,

NOV 80

43P

JAN 89

29P

PERSONAL AUTHORS: Redmon, Lynn T.

PERSONAL AUTHORS: Feth, Lawrence L.

CONTRACT NO. F49620-77-C-0004

CONTRACT NO. AFOSR-87-0091

PROJECT NO. 2301

PROJECT NO. 2313

TASK NO. A5

TASK NO. A6

MONITOR: AFOSR  
TR-89-0509

MONITOR: AFOSR

TR-89-0468

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) The interaction of Carbon Monoxide with a nickel (100) surface was examined theoretically via semi-empirical calculations. The energetics of nickel clusters (of 1 to 18 atoms) interacting with 1 to 3 CO molecules were examined. A model for the high coverage regime of CO on Ni(100) was developed. Studies with this model suggested that nickel dicarbonyl might be the desorbing species initially formed in the carbonylation process. Preliminary transition state calculations of an empirical nature indicated a large activation energy requirement for formation via a nickel monocarbonyl intermediate. Bonding of a single CO (low coverage regime) was examined on (100), (110), and (111) surfaces of nickel. In general, sites allowing multiple coordination were preferred. Nickel. (MJM)

DESCRIPTORS: (U) \*CARBON MONOXIDE, \*INTERACTIONS, \*NICKEL, \*TRANSITIONS, ACTIVATION ENERGY, CLUSTERING, COMPUTATIONS, ENERGETIC PROPERTIES, ENERGY CONSUMPTION, SURFACES.

IDENTIFIERS: (U) PE61102F, WUAFOSR2301A5.

SUPPLEMENTARY NOTE: Prepared in cooperation with Ohio State Univ. Research Foundation, Columbus, OH.

ABSTRACT: (U) The overall goal of this project is to understand the ability of the human listener to extract information from complex, time-varying sounds such as speech, music or other environmentally important signals. Specifically, we are interested in the listener's ability to process modulations of frequency and amplitude which are thought to carry the information in such signals. To that end we have devised a signal-processing model that instantiates the Envelope-Weighted Average of the signals. We initiated a series of experiments to test the performance of the new EWAIF model. Listeners were asked to discriminate between two frequency modulated tones. Testing of normal listeners in the frequency glide vs multiple-step transition task has indicated that the normal ear has a temporal window of approximately 7 to 10 msec. Further, these results appear to indicate that the critical band, thought to be ubiquitous in peripheral processing, has no effect on the listeners' discriminations of sub-critical, critical or supra-critical bandwidth swept frequency signals. (AW)

DESCRIPTORS: (U) \*AUDITORY PERCEPTION, \*DEMODULATION,

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AUDIO TONES, EAR, FREQUENCY, FREQUENCY MODULATION, MODELS,  
MUSIC, PROCESSING, SIGNAL PROCESSING, SIGNALS, SOUND,  
SPEECH, TIME, VARIATIONS, AMPLITUDE MODULATION,  
DISCRIMINATION.

MICHIGAN STATE UNIV EAST LANSING DEPT OF PEDIATRICS/  
HUMAN DEVELOPMENT

(U) The Role of Chemical Inhibition of Gap-Junctional  
Intercellular Communication in Toxicology.

IDENTIFIERS: (U) WUAFOSR2313A6, PEG1102F.

DESCRIPTIVE NOTE: Final rept. 15 Feb 86-28 Feb 89.

MAR 89 24P

PERSONAL AUTHORS: Trosko, James E.

CONTRACT NO. AFOSR-86-0084

PROJECT NO. 2312

TASK NO. A5

MONITOR: AFOSR  
TR-89-0455

UNCLASSIFIED REPORT

ABSTRACT: (U) The overall goal of this grant has been to study the mechanisms by which non-genotoxic chemicals act. Specifically, the working hypothesis has been that chemical modulation of gap junctions could lead to many toxic endpoints, such as teratogenesis, tumor promotion, immune-reproductive- and neuro-toxicities. To test this hypothesis, we set up several aims: a) to develop new methods to measure gap junction function (Fluorescence Recovery After Photo-bleaching and scrape-loading/dye transfer); b) to test if several known model non-genotoxic chemicals inhibit intercellular communication in several cell types; and c) to study the biochemical mechanisms by which various chemicals inhibit intercellular communication. Results of this 3 year study have produced a) three new validated in vitro methods to measure gap junction; b) produced overwhelming evidence that known non-genotoxic teratogens, tumor promoters, neuro-, and reproductive-toxicants can inhibit gap junction function; c) evidence suggesting several biochemical mechanisms by which these chemicals act; and d) helped develop a new theoretical framework for a biologically-based risk assessment model system. (AW)

DESCRIPTORS: (U) \*CELLS(BIOLOGY), \*CYTOCHEMISTRY, \*TOXIC AGENTS, \*TOXICITY, BIOCHEMISTRY, CHEMICAL REACTIONS.

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CHEMICALS, FLUORESCENCE, HYPOTHESES, INHIBITION, MODULATION, NEOPLASMS, RECOVERY, TERATOGENIC COMPOUNDS, RISK.

VIRGINIA UNIV CHARLOTTESVILLE DEPT OF PSYCHOLOGY  
(U) Perceptual Constraints on Understanding Physical Dynamics.

IDENTIFIERS: (U) WUAFOSR2312A5, PE61102F, \*Gap  
functional intercellular communication, \*Intercellular  
communication, Gap junctions, \*Nongenotoxic chemicals.

DESCRIPTIVE NOTE: Final rept. 1 Jun 87-31 Dec 88,

FEB 89 35P

PERSONAL AUTHORS: Proffitt, Dennis R.; Gilden, David L.

CONTRACT NO. AFOSR-88-0238

PROJECT NO. 2313

TASK NO. A4

MONITOR: AFOSR  
TR-89-0452

UNCLASSIFIED REPORT

ABSTRACT: (U) When making dynamical judgements, people can make effective use of only one salient dimension of information present in the event. People do not make dynamical judgements by deriving multidimensional quantities. Thus, the adequacy of dynamical judgements depends on the degree of dimensionality that is both 1) inherent in the physics of the event, and 2) presumed to be present by the observer. Support for this proposal was found in studies of people's dynamical understandings of 1) wheels, 2) volume displacements (Archimedes Principle), 3) the surface orientation of liquids, and 4) collisions. Additional support was found in a review of the 'Intuitive Physics' literature. Finally, studies of apparent motion indicate that the basic representation of object motions is not dynamical. Keywords: Motion perception; Naive physics; Cognition; Dynamics; Intuitive physics. (JHD)

DESCRIPTORS: (U) \*DYNAMICS, \*PERCEPTION, \*PHYSICS, COGNITION, DISPLACEMENT, JUDGEMENT(PSYCHOLOGY), MOTION, PHYSICAL PROPERTIES, QUANTITY, SIZES(DIMENSIONS), VOLUME.

IDENTIFIERS: (U) WUAFOSR2313A4, PE61102F, Archimedes principle.

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MATERIALS RESEARCH SOCIETY PITTSBURGH PA

SOUTH CAROLINA UNIV COLUMBIA DEPT OF PSYCHOLOGY

(U) Symposium: Better Ceramics Through Chemistry III.  
Volume 121.

(U) Working Memory Capacity: An Individual Differences  
Approach.

DESCRIPTIVE NOTE: Final rept. 1 Apr 88-31 Mar 89.

DESCRIPTIVE NOTE: Final rept. 1 Jan 87-30 Dec 88.

AUG 88 5P

FEB 89 23P

PERSONAL AUTHORS: Brinker, C. J.; Clark, David E.; Ulrich,  
Donald R.

PERSONAL AUTHORS: Engle, Randall W.

CONTRACT NO. AFOSR-88-0145

CONTRACT NO. AFOSR-87-0069

PROJECT NO. 2303

PROJECT NO. 2313

TASK NO. A3

TASK NO. A4

MONITOR: AFOSR

MONITOR: AFOSR  
TR-89-0464

TR-89-0444

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) This third Materials Research Society MRS  
symposium on Better Ceramics Through Chemistry was held  
April 5-9, 1988 in Reno, Nevada. It was intended to unite  
chemists and physicists with ceramists and material  
scientists in order to synthesize new and better ceramic  
materials by solution routes involving molecular  
precursors. Principal topics included sol-gel routes for  
preparing oxides, powder processing, and non-oxides. This  
symposium was distinguished from the prior ones by  
emphasizing thin film formation, high T sub C  
superconductors, and in-situ methods of characterization.  
Keywords: Thin films; Thick films; Ceramics; Nuclear  
magnetic resonance; Zeolite gel composites. (KT)

DESCRIPTORS: (U) \*CERAMIC MATERIALS, \*CHEMICAL  
ENGINEERING, CHEMISTRY, MOLECULES, NEVADA, NUCLEAR  
MAGNETIC RESONANCE, OXIDES, POWDERS, PRECURSORS,  
PROCESSING, SOLUTIONS(GENERAL), SUPERCONDUCTORS, SYMPOSIA,  
SYNTHESIS, THICK FILMS, THIN FILMS.

IDENTIFIERS: (U) WUAFOFSR2303A3, PE61102F.

ABSTRACT: (U) This article describes a research program  
addressing several issues about the role of individual  
differences in working memory and reading comprehension.  
The studies show a strong positive relationship between  
measures of working memory capacity and higher level  
measures of comprehension. More importantly, this  
relationship does not require that the working memory  
measure be a form of the comprehension measure. At least  
one variable known to be important to the complex word span,  
word length, is also important to the complex working  
memory measures used here and elsewhere and this has  
important implications for theories about the link  
between working memory and higher level tasks, at least  
those of a verbal nature. (sdw)

DESCRIPTORS: (U) \*COMPREHENSION, \*MEMORY DEVICES,  
\*READING, ADDRESSING, CAPACITY(QUANTITY), LENGTH,  
WORDS(LANGUAGE).

IDENTIFIERS: (U) WUAFOFSR2313A4, PE61102F, Individual  
differences.

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 MASSACHUSETTS UNIV AMHERST DEPT OF MATHEMATICS AND  
 STATISTICS DEPARTMENT OF ENERGY BARTLESVILLE OK BARTLESVILLE ENERGY  
 TECHNOLOGY CENTER

(U) Nonparametric Test of Independence for Censored Data.

DESCRIPTIVE NOTE: Final rept.,

JUN 80 6P

PERSONAL AUTHORS: Korwar, Ramesh

CONTRACT NO. F49620-79-C-0105

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
 TR-89-0491

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: See also AD-A090 330.

ABSTRACT: (U) In an effort to widen the area of applicability of the self-consistent estimator of a bivariate survival distribution developed earlier to more complex situations, the following situation of double censoring was considered. The Nonparametric Estimation of a Bivariate Survivorship Function with Doubly Censored Data: Frequently are doubly censored-that is, some of the data may be censored on the left (late entries) some on the right (losses) while some others may be uncensored (deaths). Keywords: Computations, Iterations. (kr)

DESCRIPTORS: (U) \*BIVARIATE ANALYSIS, \*NONPARAMETRIC STATISTICS, COMPUTATIONS, CONSISTENCY, PROBABILITY DISTRIBUTION FUNCTIONS, ESTIMATES, SURVIVAL(GENERAL).

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A5, Self consistent estimators, \*Censored data, Doubly censored data.

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(U) Thermodynamics of Organic Compounds.

DESCRIPTIVE NOTE: Final rept. 1 Oct 79-30 Sep 80.

80 28P

PERSONAL AUTHORS: Good, W. D.

CONTRACT NO. AFOSR-ISSA-80-00004

PROJECT NO. 2308

TASK NO. B1

MONITOR: AFOSR  
 TR-89-0513

UNCLASSIFIED REPORT

ABSTRACT: (U) This research program consists of an integrated and interrelated effort of basic and applied research in chemical thermodynamics and thermochemistry. Knowledge of variation of physical and thermodynamic properties with molecular structure is used to select compounds for study that because of high ring strain or unusual steric effects may have good energy characteristics per unit volume or per unit mass and thus be useful in the synthesis of high energy fuels. These materials are synthesized, and their thermodynamic properties are evaluated. In cooperation with researchers at Wright-Patterson Air Force Base, ramjet fuels currently in use are subjected to careful thermodynamic evaluation by measurements of heat capacity, enthalpy of combustion and vapor pressure. Keywords: Ramjet fuels; Ring compounds; Combustion; Enthalpy; Hydrocarbons; High energy fuels. (KT)

DESCRIPTORS: (U) \*FUELS, \*HIGH ENERGY, \*THERMOCHEMISTRY, \*THERMODYNAMIC PROPERTIES, CHEMICALS, COMBUSTION, CYCLIC COMPOUNDS, ENERGY, ENTHALPY, HYDROCARBONS, MASS, MOLECULAR STRUCTURE, ORGANIC COMPOUNDS, RAMJET ENGINES, RINGS, SPECIFIC HEAT, SYNTHESIS, TEST AND EVALUATION, THERMODYNAMICS, VAPOR PRESSURE, VOLUME.

IDENTIFIERS: (U) PE61102F, WUAFOSR2308B1, Ring compounds.

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\*High energy fuels, Ramjet fuels.

AD-A207 115 12/2

WASHINGTON UNIV SEATTLE DEPT OF AERONAUTICS AND  
ASTRONAUTICS

(U) Resonance in Weakly Nonlinear Systems.

DESCRIPTIVE NOTE: Final rept.,

MAY 80 3P

PERSONAL AUTHORS: Kevorkian, J.

CONTRACT NO. F49620-79-C-0141

PROJECT NO. 2340

TASK NO. A4

MONITOR: AFOSR  
TR-89-0521

UNCLASSIFIED REPORT

ABSTRACT: (U) Contents: 1) Adiabatic Invariants for  
Nearly Periodic Hamiltonian Systems Passing through  
Resonance; 2) Passage through Resonance; 3) Resonant Wave  
Interactions; 4) Entry Dynamics. Keywords: Mathematical  
models. (kr)

DESCRIPTORS: (U) \*NONLINEAR SYSTEMS, \*RESONANCE,  
HAMILTONIAN FUNCTIONS, INTERACTIONS, MATHEMATICAL MODELS,  
WAVES.

IDENTIFIERS: (U) PE61102F, WUAFOSR2340A4, Weakly  
nonlinear systems.

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ILLINOIS UNIV AT URBANA CENTER FOR SUPERCOMPUTING  
RESEARCH AND DEVELOPMENT

NEW YORK UNIV NY COURANT INST OF MATHEMATICAL SCIENCES

(U) Alkali-Rare Gas and Metal Halide Molecules as  
Potential Visible Lasers.

(U) Effective Behavior of Composite Materials.

DESCRIPTIVE NOTE: Final rept..

DESCRIPTIVE NOTE: Final rept. 1 Oct 79-30 Sep 80.

JUL 80 5P

OCT 80 28P

PERSONAL AUTHORS: Papanicolaou, George C.

PERSONAL AUTHORS: Eden, J. G.

CONTRACT NO. AFOSR-79-0138

PROJECT NO. 2301

PROJECT NO. 2304

TASK NO. A1

TASK NO. A4

MONITOR: AFOSR

MONITOR: AFOSR

TR-89-0494

TR-89-0523

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) The major goal of this research effort is to identify those members of the alkali rare gas and metal halide molecular families which show promise as efficient, powerful and practical visible lasers. Laser photodissociation of polyatomic molecules and self sustained discharge pumping are the primary tools being used to demonstrate lasing from these molecules. (MJM)

ABSTRACT: (U) The following four problems have been analyzed in detail. First, the effective heat removal rate for an insulating screen with many small holes has been computed. Second, the motion of a particle in a random force field has been analyzed. This is a simplified model for the study of conductivity of a solid with impurities where a high energy conduction electron is modelled by a classical particle and the impurities by a random force field. Third, nonlinear effects in the calculation of effective dielectric constants of composites (periodic and random) have been calculated. Fourth, we have analyzed the nature of the self-focusing singularity of a nonlinear beam in three dimensions. My research objectives and work are as follows: (i) Calculation of properties of boundaries and interfaces of composite materials. (ii) Wave propagation, heat conduction and other transport or dynamic effects in materials with amorphous or random structure and their effective macroscopic description. (iii) Linear and nonlinear electromagnetic effects in composites.

DESCRIPTORS: (U) \*ALKALI METAL COMPOUNDS. \*LASERS, \*POLYATOMIC MOLECULES, \*RARE GASES, HALIDES, METALS, MOLECULES, PHOTODISSOCIATION, PUMPING, TOOLS, VISIBILITY.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2301A1.

DESCRIPTORS: (U) \*COMPOSITE MATERIALS, \*ELECTROMAGNETIC PROPERTIES, AMORPHOUS MATERIALS, CONDUCTIVITY, CONSTANTS, DIELECTRIC PROPERTIES, DYNAMICS, ELECTRICAL CONDUCTIVITY, ELECTRONS, FOCUSING, HEAT, HIGH ENERGY, HOLES(OPENINGS), IMPURITIES, INTERFACES, LINEARITY, MODELS, NONLINEAR SYSTEMS, PARTICLES, RATES, REMOVAL, SELF OPERATION.

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OTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI32L

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AD-A207 112 12/2

SIMPLIFICATION. THERMAL CONDUCTIVITY, WAVE PROPAGATION.

FLORIDA UNIV GAINESVILLE DEPT OF MATHEMATICS

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A4.

(U) Some Remarks on Reachability of Infinite-Dimensional Linear Systems.

DESCRIPTIVE NOTE: Interim rept..

MAR 79 18P

PERSONAL AUTHORS: Yamamoto, Yutaka

CONTRACT NO. DAAG29-77-G-0225, \$AFOSR-76-3034

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-89-0486

UNCLASSIFIED REPORT

ABSTRACT: (U) This paper we shall be concerned with the question of reachability when allowing distribution inputs. We show that a certain class of systems accept distribution inputs, but, in general they cannot be exactly reachable. We shall also consider the problem of the uniqueness of canonical realizations in relation to exact reachability, and show that Matsuo's result on uniqueness does not apply to the example given in Baras, Brockett, and Fuhrmann.

DESCRIPTORS: (U) \*LINEAR SYSTEMS, INFINITE SERIES, DISTRIBUTION, INPUT, SIZES(DIMENSIONS).

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A1.

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TEXAS UNIV AT AUSTIN DEPT OF MECHANICAL ENGINEERING

RUTGERS - THE STATE UNIV NEW BRUNSWICK N J DEPT OF MATHEMATICS

(U) Potential Complex-Lamellar Decomposition of Fluid Flows.

DESCRIPTIVE NOTE: Final rept..

JUN 80

4P

PERSONAL AUTHORS: Panton, Ronald L.

CONTRACT NO. AFOSR-79-0081

PROJECT NO. 2304

TASK NO. A4

MONITOR: AFOSR  
TR-89-0517

UNCLASSIFIED REPORT

ABSTRACT: (U) Application of the potential complex-lamellar decomposition to the velocity field of a fluid flow was investigated. It was hoped that this decomposition would aid in understanding flows where both irrotational and vortical motions are occurring simultaneously (turbulence, aerodynamic noise, three-dimensional boundary layers). After considerable preliminary study it was found that the basic premise of the work was invalid. This result means that the flexibility of the decomposition is not as great as anticipated, and that further work on three-dimensional flows with viscous is not appropriate. Work on applying the decomposition to inviscid, vortical, three-dimensional flows (plasmas) is being pursued by other researchers. (edc)

DESCRIPTORS: (U) \*FLUID FLOW, AERODYNAMIC NOISE, BOUNDARY LAYER, DECOMPOSITION, INVISCID FLOW, THREE DIMENSIONAL FLOW, TURBULENCE, VELOCITY, VORTICES.

IDENTIFIERS: (U) Plasmas, PE61102F, WUAFOSR2304A4.

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(U) Applications of Graph Theory and System Theory to Large Scale Systems.

DESCRIPTIVE NOTE: Final rept..

JUL 80

9P

PERSONAL AUTHORS: Roberts, Fred S.; Sontag, Eduardo D.

\* CONTRACT NO. F49620-79-C-0117

PROJECT NO. 2304

TASK NO. A6

MONITOR: AFOSR  
TR-89-0515

UNCLASSIFIED REPORT

ABSTRACT: (U) In graph theory, the minimum cardinality (infimum measure) of set colorings, phasings, and intersection assignments has been studied for the important cases where there is no restriction on the sets, where each set is a real interval, and where each set is a consecutive set of integers. The maximum cardinality score (supremum measure score) has also been studied in these cases. Progress has included the development of general procedures, explicit formulas, and efficient algorithms. Related work has explored a series of ultimate numbers related to the n-chromatic numbers, and the structural characterization of certain classes of graphs of boxicity at most 2, which generalize the interval graphs. In system theory, a computationally oriented approach to nonlinear system regulation has been developed, based on the notion of piecewise-linear systems. The necessary algebraic concepts had to be themselves developed during the course of the research. New designs and theoretical results were obtained also for the control and observation of parametrized families of systems, and for delay and other well-known types of systems. (KR)

DESCRIPTORS: (U) \*SYSTEMS ANALYSIS, \*GRAPHS, \*THEORY, ALGEBRA, ALGORITHMS, EFFICIENCY, INTERVALS, NONLINEAR

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OTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI32L

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AD-A207 109 20/4

SYSTEMS, NUMBERS, REGULATIONS, SYSTEMS ANALYSIS.

CALIFORNIA UNIV LOS ANGELES DEPT OF MATHEMATICS

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A6, Large scale systems.

(U) Transonic Aerodynamics.

DESCRIPTIVE NOTE: Final rept.,

AUG 80 2P

PERSONAL AUTHORS: Cole, Julian; Cook, L. P.; Ziegler, F.

CONTRACT NO. F49620-79-C-0162

PROJECT NO. 2304

TASK NO. A4

MONITOR: AFOSR  
TR-89-0516

UNCLASSIFIED REPORT

ABSTRACT: (U) A study has been made of finite span wings flying at the speed of sound. The general form of inner and outer expansions in terms of  $B = \text{reduced aspect ratio}$  has been deduced. Suitable far field and near field expansions have been constructed and matched asymptotically. A new integral formula for the essential physical scale of the problem has been derived. (edc)

DESCRIPTORS: (U) \*WINGS, \*TRANSONIC FLOW, AERODYNAMICS, ASPECT RATIO, FAR FIELD, FORMULAS(MATHEMATICS), NEAR FIELD, PHYSICAL PROPERTIES, SCALE, TRANSONIC CHARACTERISTICS.

IDENTIFIERS: (U) Finite span wings, PE61102F, WUAFOSR2304A4.

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ILLINOIS UNIV AT CHICAGO CIRCLE DEPT OF MATHEMATICS

MODELS, \*RELIABILITY, AIR FORCE, COHERENCE, DATA ACQUISITION, DATA PROCESSING, DEPLETION, INVENTORY, LIFE EXPECTANCY(SERVICE LIFE), MULTIVARIATE ANALYSIS, QUALITY, STATISTICS, STRUCTURAL PROPERTIES.

(U) Design of Experiments and Reliability Models.

DESCRIPTIVE NOTE: Final scientific rept..

IDENTIFIERS: (U) PE61102F, WUAFOSR3204A5.

AUG 80 10P

PERSONAL AUTHORS: Hedayat, A.

CONTRACT NO. AFOSR-76-3050

PROJECT NO. 3204

TASK NO. A5

MONITOR: AFOSR  
TR-89-0518

UNCLASSIFIED REPORT

ABSTRACT: (U) Our research efforts have been concentrated on two main areas: Design of experiments and Reliability. In the area of design of experiments we have studied problems of data collection relevant to virtually all Air Force technical areas. There is a strong need in the Air Force to reduce costs and save time in the collection of large amounts of data. The reduction in costs and time should be done clearly without any damage to the statistical quality of the data being collected. Our research problems not only add to our store of knowledge about multifacet of data collection and data analysis in general, but they have immediate applications to many important problems which the United States Air Force is faced with. In the area of reliability our efforts have been mainly directed towards developing comprehensive treatments of various reliability models which have useful applications in determining and improving levels of performance and reliabilities of complex systems and their components. These models include: 1) A simple model in structural reliability which has applications in various areas such as inventory depletion, urn models, etc.; 2) Multivariate life distributions useful in modeling system with dependent components; and 3) Multistate (Degradable) Coherent Systems. (KR)

DESCRIPTORS: (U) \*EXPERIMENTAL DESIGN, \*MATHEMATICAL

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI32L

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CONNECTICUT UNIV STORRS DEPT OF MATHEMATICS

VIRGINIA POLYTECHNIC INST AND STATE UNIV BLACKSBURG  
INTERDISCIPLINARY CENTER FOR APPLIED MATHEMATICS

(U) Convergence and Performance of Synchronous and  
Asynchronous Parallel and Conventional Iterative  
Methods.

(U) State Space Models for Aeroelastic and Viscoelastic  
Systems.

DESCRIPTIVE NOTE: Annual rept. 1 Jan-31 Dec 88,

DESCRIPTIVE NOTE: Technical rept. 1 Jan-31 Dec 88,

FEB 89 6P

FEB 89 5P

PERSONAL AUTHORS: Neumann, Michael

PERSONAL AUTHORS: Herdman, T. L.

REPORT NO. 1171-000-22-00211-06-194

CONTRACT NO. AFDSR-88-0074

CONTRACT NO. AFDSR-88-0047

PROJECT NO. 2304

PROJECT NO. 2304

TASK NO. A9

TASK NO. A3

MONITOR: AFDSR

MONITOR: AFDSR

TR-89-0380

TR-89-0327

UNCLASSIFIED REPORT

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DESCRIPTORS: (U) \*SIMULTANEOUS EQUATIONS, ITERATIONS,  
SOLUTIONS(GENERAL), ALGORITHMS, COMPUTERIZED TOMOGRAPHY,  
IMAGE PROCESSING.

ABSTRACT: (U) Dynamic modeling of various aeroelastic  
control systems require at some point in the derivation  
of the model an application of Soehngen's inversion  
formula for finite Hilbert transforms to obtain a desired  
representation for the solution of the airfoil equation.  
Conditions on initial data to guarantee well-posedness of  
the resulting model equations must be matched with those  
needed to justify the validity of the inversion formula.  
We showed that this compatibility can be achieved by  
assuming that the circulation history belongs to a  
weighted L2 space. The resulting state space formulation  
provides a suitable setting for control design for the  
aeroelastic system. Keywords: Mathematical models;  
Mathematical formulas; Aerodynamic control surfaces;  
Dynamic response.

DESCRIPTORS: (U) \*AERODYNAMIC CONTROL SURFACES,  
\*AEROELASTICITY, \*DYNAMIC RESPONSE, \*VISCOELASTICITY,  
AIRFOILS, CIRCULATION, CONTROL SYSTEMS, DYNAMICS,  
FORMULAS(MATHEMATICS), FORMULATIONS, INVERSION,  
MATHEMATICAL MODELS, MODELS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A9, Soehngen  
inversion formula, Finite Hilbert transforms.

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AD-A207 086 12/5

AD-A207 085 11/6.2 11/6

COLORADO STATE UNIV FORT COLLINS DEPT OF MATHEMATICS

ILLINOIS UNIV AT URBANA DEPT OF MATERIALS SCIENCE AND ENGINEERING

(U) Data Fitting.

DESCRIPTIVE NOTE: Final rept. 1 Jul 79-30 Jun 80.

(U) Al and Mg Alloys for Aerospace Applications Using Rapid Solidification and Powder Metallurgy Processing.

80 4P

DESCRIPTIVE NOTE: Final technical rept..

PERSONAL AUTHORS: Taylor, Gerald D.

MAR 89 99P

CONTRACT NO. F49620-79-C-0124

PERSONAL AUTHORS: Fraser, Hamish L.

PROJECT NO. 2304

CONTRACT NO. AFOSR-85-0191

TASK NO. A3

PROJECT NO. 2306

MONITOR: AFOSR  
TR-89-0500

MONITOR: AFOSR  
TR-89-0401

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) The objectives of this research were to study and develop numerical software for the efficient representation of numerical data in digital computers. This effort includes the testing of existing numerical software to identify effective strategies and methodologies, the development of new algorithms and hybrid algorithms from existing algorithms, and the development of numerical software that imposes specific side conditions on the approximations. (KR)

DESCRIPTORS: (U) \*DATA REDUCTION, \*FITTING FUNCTIONS(MATHEMATICS), ALGORITHMS, COMPUTER PROGRAMS, EFFICIENCY, DIGITAL COMPUTERS, HYBRID SYSTEMS, NUMERICAL ANALYSIS.

IDENTIFIERS: (U) PEG1102F, WUAFOSR, \*Data fitting, \*Numerical data representation.

ABSTRACT: (U) The work performed during the past three years has involved studies of some elevated temperature Aluminum and Magnesium alloys, and in addition a preliminary study of intermetallic compounds based on Al<sub>3</sub>X, where X is Ti, V, and Ni+Ti. In the case of the Al alloys, this work was in essence a continuation of the work performed during the preceding three years of study, where rapid solidification processing (RSP) of Al alloys was investigated. Two areas were investigated, one involving alloys which might exhibit high elastic modulus, and the second concerned the improvement in fracture toughness when Si is added to Al-Fe-Mo alloys. It was found that the modulus increases Al-Be alloys processed by rapid solidification were as expected from theory, whereas those for Al-Mn alloys were somewhat below expectation. This latter result was attributed to casting porosity present in our samples. In terms of the Al-8Fe-2Mo-Si alloys (where both 0.5% and 1.0% Si have been added), the development of microstructure following RSP has been studied in alloys with, and without, the Si additions. The presence of Si resulted in the information of the compound alpha-AlFeSi, with space group determined to be Im3 by convergent beam electron diffraction. The morphology of the precipitates of this compound were found to be approximately spherical and when compared

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with the lenticular precipitates in the case of consolidated Al-8Fe-2Mo, this shape is thought to account for the difference in fracture toughness results.  
Keywords: Powder metallurgy, Powder compaction. (aw)

DESCRIPTORS: (U) \*ALUMINUM ALLOYS, \*MAGNESIUM ALLOYS, \*POWDER METALLURGY, \*SOLIDIFICATION, AEROSPACE SYSTEMS, ALLOYS, ALUMINUM, CASTING, COMPACTING, CONVERGENCE, ELECTRON DIFFRACTION, FRACTURE(MECHANICS), HIGH TEMPERATURE, INTERMETALLIC COMPOUNDS, MANGANESE ALLOYS, MODULUS OF ELASTICITY, MORPHOLOGY, POROSITY, POWDERS, PRECIPITATES, PROCESSING, QUICK REACTION, TOUGHNESS, NICKEL, BERYLLIUM, IRON, MOLYBDENUM, SILICON.

IDENTIFIERS: (U) PE61102F, WUAFOSR2306A1.

FLORIDA UNIV GAINESVILLE SPACE ASTRONOMY LAB

(U) The Interaction of Solid Particles with Laser Beams.

DESCRIPTIVE NOTE: Final rept.,

APR 89 108P

PERSONAL AUTHORS: Misconi, Nebil Y.; Rusk, Edwin T.; Oliver, John P.

CONTRACT NO. F49620-85-C-0117

PROJECT NO. 2306

TASK NO. A2

MONITOR: AFOSR  
TR-89-0475

UNCLASSIFIED REPORT

ABSTRACT: (U) Light scattering curves of intensity vs. scattering angle were made of 1) layers of transparent silica particles, 2) single silica particles isolated by optical levitation; using an Argon ion laser light source and a goniometer mounted silicon photodiode detector. Scattering measurements of spherical particles demonstrated an excellent agreement with Mie theory. Spheroids and irregular particles were also measured. Dynamics of particles in a space environment were studied both theoretically, and experimentally inside a 10 to the -7th power Torr vacuum chamber. Research in this area will be continued to determine the effective moment arm of optically induced particle rotation. Keywords: Laser beam, Particle interaction, Light scattering, Laser particle levitation. (JHD)

DESCRIPTORS: (U) \*LASER BEAMS, \*LIGHT SCATTERING, ANGLES, DYNAMICS, INTERACTIONS, ARGON LASERS, MEASUREMENT, PARTICLES, SCATTERING, SILICON DIOXIDE, SOLIDS, SPACE ENVIRONMENTS, SPHERES, TRANSPARENCY, VACUUM CHAMBERS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2306A2, Argon ion lasers.

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AD-A207 054 CONTINUED

ILLINOIS UNIV AT URBANA DEPT OF MECHANICAL AND INDUSTRIAL ENGINEERING

(U) Spectroscopic Diagnostics of Electron Temperature and Energy Conversion Efficiency of Laser-Sustained Plasma in Flowing Argon.

DESCRIPTIVE NOTE: Rept. for 1 Sep 87-8 Aug 88.

AUG 88 91P

PERSONAL AUTHORS: Mazumder, J., Krier, H.; Chen, X.

REPORT NO. UIIU-ENG-88-4014

CONTRACT NO. AFOSR-87-0169, \$AFOSR-88-0129

PROJECT NO. 2308

TASK NO. A1

MONITOR: AFOSR  
TR-89-0442

UNCLASSIFIED REPORT

ABSTRACT: (U) Laser sustained plasmas are often formed during laser materials interaction. The University's 10 kW CW CO2 laser has been used to study argon plasmas for the application to laser supported propulsion and laser materials processing. The spectroscopic diagnostic method has been applied to study laser-sustained plasmas in 1 atmosphere pure argon gas flow with an f/7 on-axis laser focusing scheme. High flow speeds of 2 to 10 m/sec are achieved. Plasma electron temperatures distributions are determined from the 415.8 nm ArI line and its adjacent continuum intensities. Plasma core temperatures as high as 20,000 K are reported. The total absorption of the incident laser power and the radiation loss by the plasma are calculated from the temperature distribution. Results indicated that up to 86 percent of the incident laser power can be absorbed and nearly 60 percent of the incident laser power can be retained by the flowing argon gas to provide thrust. Further research is called for in the laser induced fluorescence (LIF) technique for diagnostics of the downstream mixing zone and the plasma outer region. Experiments over a wider range of operating conditions, as well as multiple plasma testings, are

required to find the optimum operating scheme. Keywords: Laser sustained plasmas, Spectroscopy, Plasmas, Beamed energy conversion. (MJM)

DESCRIPTORS: (U) \*ARGON, \*GAS FLOW, \*LASER INDUCED FLUORESCENCE, \*LASERS, \*PLASMAS(PHYSICS), ABSORPTION, CORES, DIAGNOSIS(GENERAL), DISTRIBUTION, EFFICIENCY, ELECTRON ENERGY, ELECTRONS, ENERGY CONVERSION, FLOW, HIGH RATE, HIGH VELOCITY, INTENSITY, INTERACTIONS, LASER MATERIALS, LOSSES, MIXING, POWER, PROCESSING, PROPULSION SYSTEMS, RADIATION, SPECTROSCOPY, TEMPERATURE.

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GENERAL ELECTRIC CO SYRACUSE NY ELECTRONICS LAB

(U) Pseudomorphic In(x).

DESCRIPTIVE NOTE: Annual rept. 1 Mar 88-30 Mar 89.

MAR 89 24P

PERSONAL AUTHORS: Ballingall, James M.; Ho, P.; Martin, T. YU

CONTRACT NO. F49620-88-C-0054

PROJECT NO. 2305

TASK NO. C1

MONITOR: AFOSR  
TR-89-0463

UNCLASSIFIED REPORT

ABSTRACT: (U) The objective of this program is to evaluate the dependence of pseudomorphic InxGa1-xAs quality on epitaxial growth conditions and InxGa1-xAs composition. All of the structures are fabricated by molecular beam epitaxy (MBE). The effects of different growth conditions are being evaluated with a combination of characterization techniques, including Hall effect, photoluminescence, transmission electron microscopy (TEM), and in-situ reflection high energy electron diffraction (RHEED). The electron spatial distribution and energy levels for quantized pseudomorphic structures are calculated self-consistently and compared with experiment. Critical layer thickness is shown to be a function of MBE growth temperature and the interruption of InxGa1-xAs growth with a few monolayers of GaAs is shown to smooth the InxGa1-xAs surface and provide strain energy relief, substantially extending the critical layer thickness. This new class of strained layer heterostructures which are here named thin strained superlattices (TSSL) extends the practical range of application of the GaAs-InxGa1-xAs system and is anticipated to be generally applicable to other strained layer systems. A publication describing the concept and demonstrating its practicality is tentatively scheduled for the May 22, 1989 issue of Applied Physics Letters. Also, results will be presented at the Electronic Materials Conference June 21-23, 1989

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at the Massachusetts Institute of Technology. Keywords: Indium compounds, Aluminum gallium arsenide, Gallium arsenides. (MJM)

DESCRIPTORS: (U) \*ALUMINUM GALLIUM ARSENIDE, \*ELECTRON MICROSCOPY, \*GALLIUM ARSENIDES, \*INDIUM COMPOUNDS, DISTRIBUTION, ELECTRONIC EQUIPMENT, ELECTRONS, ENERGY LEVELS, ENVIRONMENTS, EPITAXIAL GROWTH, GROWTH(GENERAL), HALL EFFECT, LAYERS, MATERIALS, MOLECULAR BEAMS, PHOTOLUMINESCENCE, SPATIAL DISTRIBUTION, STRUCTURES, SYMPOSIA, TEMPERATURE, THICKNESS, TRANSMITTANCE.

IDENTIFIERS: (U) WUAFOSR2305C1, PE61102F, \*indium gallium arsenides.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI32L

AD-A207 027 20/9

AD-A207 018 9/1 20/12

WEST VIRGINIA UNIV MORGANTOWN DEPT OF MATHEMATICS

CARNEGIE-MELLON UNIV PITTSBURGH PA DEPT OF ELECTRICAL  
AND COMPUTER ENGINEERING

(U) Problems in Dynamic Phase Transition.

DESCRIPTIVE NOTE: Final rept. 1 Sep 87-30 Sep 88.

(U) High Density Ion Implanted Contiguous Disk Bubble  
Technology.

NOV 88 6P

DESCRIPTIVE NOTE: Final scientific rept. 30 Sep 84-29 Sep  
88.

PERSONAL AUTHORS: Hattori, Harumi

CONTRACT NO. AFOSR-87-0347

PROJECT NO. 2304

PERSONAL AUTHORS: Kryder, Mark H.; Alex, Michael; Cowen,  
Allen B.; Greve, David W.; Guzman, A.

TASK NO. A9

CONTRACT NO. AFOSR-84-0341

MONITOR: AFOSR  
TR-89-0376

PROJECT NO. 2305

TASK NO. C1

UNCLASSIFIED REPORT

MONITOR: AFOSR

TR-89-0476

ABSTRACT: (U) This paper, on the existence of  
intermediate magnetohydrodynamic shock waves, has used  
the technique called the connection matrix to establish  
one of the intermediate shocks which has not been shown  
to exist. There are a few approaches to the phase  
transition problem. One is to consider the momentum  
equation and another one is to consider the energy  
equation. Keywords: Initial boundary value problems. (JHD)

DESCRIPTORS: (U) \*PLASMA WAVES, \*MAGNETOHYDRODYNAMIC  
WAVES, \*SHOCK WAVES, BOUNDARY VALUE PROBLEMS, ENERGY,  
MOMENTUM, PHASE TRANSFORMATIONS.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2304A9, Initial value  
problems.

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ABSTRACT: (U) The main thrust of research carried out  
under this program was to develop high density ion-  
implanted contiguous-disk bubble memory devices. These  
devices offer order of magnitude higher bit density than  
presently manufactured bubble memory devices for a given  
lithographic resolution. In one phase of the research, a  
computer simulator was constructed and used to model the  
operation of ion-implanted contiguous-disk bubble devices.  
Input parameters for the simulator include the geometry  
of the implanted patterns, magnetic characteristics of  
the bubble film, implanted layer thickness, conductor  
geometry, amplitude and phase of currents in conductors,  
and the frequency and amplitude of the drive field. The  
fields acting upon the bubble include those from the  
conductors, implanted/unimplanted boundaries and charged  
walls. Using the model, the operation of various gates  
for ion-implanted devices was analyzed, including a  
trapping transfer gate and a dual conductor block  
replicate gate. A novel true swap gate for ion-implanted  
bubble devices was also devised and simulated. The  
simulated bias margins of both propagation structures and  
gates were found to correspond well with experimental  
measurements. (RH)

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CARNEGIE-MELLON UNIV PITTSBURGH PA DEPT OF COMPUTER  
SCIENCE

DESCRIPTORS: (U) \*BUBBLE MEMORIES, \*MAGNETIC DISKS, \*ION  
IMPLANTATION, LITHOGRAPHY, RESOLUTION, FILMS, MAGNETIC  
FIELDS, TRAPPING(CHARGED PARTICLES), DOMAIN WALLS,  
GATES(CIRCUITS), GRAIN BOUNDARIES, ELECTRIC CURRENT.

(U) Proceedings of the Connectionists Models Summer School  
Held in Pittsburgh, Pennsylvania on June 17-26, 1988.

IDENTIFIERS: (U) PE61102F, WUAFOSR2305C1, Contiguous  
disk memories, High density, Magnetic films, Charged  
walls, Transfer gates, Swap gates, Implanted boundaries.

DESCRIPTIVE NOTE: Final technical rept. 14 Nov 87-14 Nov  
88.

FEB 89 531P

PERSONAL AUTHORS: Touretzky, David; Hinton, Geoffrey;  
Sejnowski, Terrence

CONTRACT NO. AFOSR-88-0067

PROJECT NO. 2313

TASK NO. A4

MONITOR: AFOSR  
TR-89-0443

UNCLASSIFIED REPORT

Availability: Morgan Kaufmann Publishers, Inc., 2929  
Campus Drive, San Mateo, CA 94403, PC \$24.95. No copies  
furnished by DTIC/NTIS.

ABSTRACT: (U) Contents: Back-Propagation Learning;  
Sequential and Recurrent Networks; New Learning  
Architectures; Analysis of Networks; Language and  
Cognition; Speech Recognition; Vision; Part 8 Hardware.  
(KR)

DESCRIPTORS: (U) \*MODELS, \*SPEECH RECOGNITION,  
ARCHITECTURE, COGNITION, LEARNING, PENNSYLVANIA, SCHOOLS,  
SUMMER, VISION.

IDENTIFIERS: (U) PE61102F, WUAFOSR2313A4.

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AD-A207 004 20/11 13/13

STATE UNIV OF NEW YORK AT ALBANY RESEARCH FOUNDATION

STANFORD UNIV CA DEPT OF MECHANICAL ENGINEERING

(U) Qualitative Results for Distributed Systems.

(U) Mathematical Modeling and Numerical Simulation of the Dynamics of Flexible Structures Subject to Large Overall Motions.

DESCRIPTIVE NOTE: Final scientific rept. 1 Jul 85-30 Jun 88.

DESCRIPTIVE NOTE: Final rept. 31 Jul 86-30 Jul 88.

OCT 88 10P

89 19P

PERSONAL AUTHORS: Inman, Daniel J.

PERSONAL AUTHORS: Simo, J. C.

CONTRACT NO. AFOSR-85-0220

CONTRACT NO. AFOSR-86-0292

PROJECT NO. 2304

PROJECT NO. 2304

TASK NO. A1

TASK NO. A1

MONITOR: AFOSR  
TR-89-0426

MONITOR: AFOSR  
TR-89-0425

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) This document summarizes the research accomplished under the support of AFOSR-85-0220 from the period of July 1, 1985 to June 30, 1988. Results obtained during this period under AFOSR support are briefly described in the first section. This section is followed by listings of books published, papers published, proceedings published, degrees granted and lectures given while the PI was under Air Force Support. Several results were obtained under the support of this grant which related to the distributed parameter, or partial differential equation, model of a flexible structure. The global model forming the thrust of this research is given by a set of partial differential equations defined on some domain  $\Omega$  with the appropriate boundary and initial conditions. Keywords: Bibliographies, Hilbert space. (kr)

DESCRIPTORS: (U) \*BOUNDARY VALUE PROBLEMS, \*PARTIAL DIFFERENTIAL EQUATIONS, BIBLIOGRAPHIES, DISTRIBUTION, FLEXIBLE STRUCTURES, HILBERT SPACE, MODELS, PARAMETERS

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A1, Initial value problems.

AD-A207 005

AD-A207 004

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ABSTRACT: (U) A new modelling and computational task for the integrated design of flexible structures undergoing large overall motions has been developed and analyzed. This new approach utilizes geometrically exact structured models and have the advantage that these models can handle coupled rigid body-flexible appendage systems without resorting to the introduction of the so-called floating frames. (JHD)

DESCRIPTORS: (U) \*FLEXIBLE STRUCTURES, \*MATHEMATICAL MODELS, \*DIGITAL SIMULATION, COMPUTATIONS, DYNAMICS, FLOATING BODIES, FRAMES, INTEGRATED SYSTEMS, NUMERICAL ANALYSIS.

IDENTIFIERS: (U) PE61102F02F, WUAFWUAFOSR2304A1.

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DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVI32L

AD-A207 003 21/2 14/2

AD-A207 001 12/3 12/4

PURDUE UNIV LAFAYETTE IN DEPT OF CHEMISTRY

MISSOURI UNIV-COLUMBIA DEPT OF STATISTICS

(U) Asynchronous Optical Sampling for Laser-Based Combustion Diagnostics in High-Pressure Flames.

(U) International Research Conference on Reliability.

DESCRIPTIVE NOTE: Final rept. 15 Dec 88-31 Jan 89.

DESCRIPTIVE NOTE: Final rept. 1 Apr-30 Sep 88.

FEB 89 21P

NOV 88 8P

PERSONAL AUTHORS: King, Galen B.; Laurendeau, Normand M.; Lytle, Fred E.

PERSONAL AUTHORS: Basu, Asit P.

CONTRACT NO. AFOSR-84-0323

CONTRACT NO. AFOSR-88-0144

PROJECT NO. 2308

PROJECT NO. 2304

TASK NO. A2

TASK NO. A5

MONITOR: AFOSR

MONITOR: AFOSR

TR-89-0410

TR-89-0377

UNCLASSIFIED REPORT

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ABSTRACT: (U) This report describes progress on the development of a new laser-based combustion diagnostic for the quantitative measurement of both major and minor species in high pressure flames. The technique, Asynchronous Optical Sampling (ASOPS), is a state-of-the-art improvement in picosecond pump/probe spectroscopy. The timing parameters for the current ASOPS instrument are described and consideration is given to the optimization of these parameters. Results from the study of the sodium atom in an atmospheric flame are presented. Instrumental changes are shown that considerably improve the ASOPS signal-to-noise ratio. A technique for optimization of ultra violet generation is demonstrated and initial hydroxyl fluorescence experiments are described. Keywords: Pump probe spectroscopy; Combustion; Laser diagnostics; Stimulated emission. (MUM)

DESCRIPTORS: (U) \*COMBUSTION, \*DIAGNOSIS(GENERAL), \*FLAMES, \*LASER APPLICATIONS, ASYNCHRONOUS SYSTEMS, ATOMS, EMISSION, HIGH PRESSURE, MEASUREMENT, OPTICAL PROPERTIES, OPTIMIZATION, PARAMETERS, PROBES, PUMPS, SAMPLING, SIGNAL TO NOISE RATIO, SODIUM, SPECTROSCOPY, STIMULATION(GENERAL), TIMING DEVICES, ULTRAVIOLET RADIATION.

IDENTIFIERS: (U) PE61102F, WUAFOSR2308A2.

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ABSTRACT: (U) An international research conference on RELIABILITY was held at the University of Missouri-Columbia, Missouri, May 17-19, 1988. The primary purpose of the conference is to bring together researchers from industry, government and universities so that they may exchange ideas to identify directions for future relevant research in reliability. Here reliability is interpreted in its broadest sense. The conference is planned by the Research Subcommittee of the American Statistical Association Productivity and Quality Committee and is sponsored by the University of Missouri. Other organizations are also expected to sponsor the conference. The program will consist of invited and contributed papers on a broad spectrum of topics. Among proposed topics are: Accelerated Tests, Artificial Intelligence and Expert Systems, Automatic Diagnostics of Complex Systems, Bayesian Reliability, DataBase Analysis; Network Reliability; Government Documents on Reliability; Reliability Growth; Reliability Management; Repairable Systems; Software Reliability. (KR)

DESCRIPTORS: (U) \*COMPUTER PROGRAM RELIABILITY, \*SYSTEMS MANAGEMENT, \*RELIABILITY, ACCELERATED TESTING, ARTIFICIAL INTELLIGENCE, AUTOMATIC, BAYES THEOREM, DATA BASES, DIAGNOSIS(GENERAL), DOCUMENTS, GROWTH(GENERAL), NETWORKS, PRODUCTIVITY, QUALITY CONTROL, REPAIR, STATISTICAL ANALYSIS, SYMPOSIA.

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AD-A207 000 12/1

WISCONSIN UNIV-MADISON DEPT OF COMPUTER SCIENCES

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A5.

(U) Numerical Analysis.

DESCRIPTIVE NOTE: Annual rept. 15 Jun 87-14 Jun 88.

89 6P

PERSONAL AUTHORS: Parter, Seymour V.

CONTRACT NO. AFOSR-86-0163

PROJECT NO. 2304

TASK NO. A3

MONITOR: AFOSR  
TR-89-0378

UNCLASSIFIED REPORT

ABSTRACT: (U) Work has continued during this period on the following projects: 1) The role of regularity in Multigrid methods -- computational experiments and analytical studies on the V-cycle in an L-shaped domain; 2) Preconditioning and boundary values -- study of preconditioning of elliptic operators; and 3) Preconditioning, boundary values and mixed mode -- extension of 2) above to hyperbolic operators. Keywords: Bibliographies; Linear equations; Partial differential equations. (KR)

DESCRIPTORS: (U) \*NUMERICAL ANALYSIS, \*PARTIAL DIFFERENTIAL EQUATIONS, BIBLIOGRAPHIES, COMPUTATIONS, LINEAR ALGEBRAIC EQUATIONS, MULTIMODE, BOUNDARY VALUE PROBLEMS, OPERATORS(MATHEMATICS).

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A3, Hyperbolic operators, Elliptic operators.

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TEXAS A AND M UNIV COLLEGE STATION DEPT OF ELECTRICAL  
ENGINEERING

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A6, Robust  
estimation.

(U) Geometric Methods with Application to Robust Detection  
and Estimation.

DESCRIPTIVE NOTE: Final rept. 1 Jan 87-31 Dec 88.

89 11P

PERSONAL AUTHORS: Halverson, Don R.

CONTRACT NO. AFOSR-87-0087

PROJECT NO. 2304

TASK NO. A6

MONITOR: AFOSR  
TR-89-0382

UNCLASSIFIED REPORT

ABSTRACT: (U) We have obtained a number of results  
pertaining to image compression, robust estimation, and  
robust signal detection. All of this work has admitted  
the presence of data whose statistics are imperfectly  
known. Our results have featured adaptivity, flexibility,  
and nontraditional approaches. In order to employ more  
realistic statistical models, we have directed our  
research to admit nonstationarity and dependency. Much of  
our work in robust estimation admit nonstationarity and  
dependency. Much of our work in robust estimation and  
detection has employed a geometric approach which we have  
originated in past research. Our geometric techniques  
provide a quantitative way to measure the degree of  
robustness, thus offering the designer more flexibility  
in the meeting the performance/robustness, needs of the  
user. Our most recent results have resulted in the  
admission of essentially arbitrary dependent data, thus  
leading to a number of important conclusions pertaining  
to signal detection and the estimation of a random  
variable. (KR)

DESCRIPTORS: (U) \*DATA COMPRESSION, \*IMAGE PROCESSING,  
DETECTION, GEOMETRY, MATHEMATICAL MODELS, SIGNALS,  
STATISTICAL ANALYSIS.

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AD-A206 998 CONTINUED

RENNSELAER POLYTECHNIC INST TROY N Y DEPT OF CHEMISTRY

(U) Preparation of SiC/AlN Solid Solutions Using  
Organometallic Precursors.

DESCRIPTORS: (U) ORGANOMETALLIC COMPOUNDS, PRECURSORS,  
SOLID SOLUTIONS.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2303A3.

DESCRIPTIVE NOTE: Final scientific rept. 30 Sep 85-31 Dec  
88.

FEB 89 15P

PERSONAL AUTHORS: Interrante, L. V.

CONTRACT NO. F49620-85-K-0019

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-89-0384

UNCLASSIFIED REPORT

ABSTRACT: (U) The co-pyrolisis of organoaluminum and organosilicon compounds was investigated as a potential source of SiC/AlN solid solutions. Using two different co-pyrolisis methods, homogeneous mixture of organoaluminum amides and both a vinyllic polysilane and a polycarbosilane were converted to a pre-ceramic solid that transformed to crystalline SiC/AlN solid solutions at < 1600 C. Moreover, the liquid, polymeric, form of these precursor mixtures provides a potential processing advantage that may be useful for ceramic matrix preparation and other applications. In the course of this work new precursors to both ALN and SiC were identified and their structures and pyrolysis reactions were investigated, providing useful information regarding structure/pyrolysis chemistry relationships for such precursor systems. In addition, modifications of this co-pyrolisis approach to SiC/AlN solid solutions were employed to obtain mixed-phase SiC/AlN solid solutions were employed to obtain mixed-phase SiC/ALN, silicon nitride, silicon nitride/ALN and Beta-SIALON ceramics. The composition, phase distribution, and microstructure of these ceramics were examined by elemental analysis, x-ray powder diffraction, SEM/TEM, and other methods. Keywords: Aluminum nitrides; Organometallic compound. (AW)

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## WISCONSIN UNIV-MADISON CENTER FOR MATHEMATICAL SCIENCES

(U) A Fast Algorithm for Non-Newtonian Flow. An Enhanced Particle-Tracking Finite Element Code for Solving Boundary-Value Problems in Viscoelastic Flow.

DESCRIPTIVE NOTE: Final rept. 1 Apr 85-30 Sep 88.

JAN 89 41P

PERSONAL AUTHORS: Malkus, David S.

CONTRACT NO. AFOSR-85-0141

PROJECT NO. 2304

TASK NO. A9

MONITOR: AFOSR  
TR-89-0381

## UNCLASSIFIED REPORT

ABSTRACT: (U) This project concerned the development of a new fast finite element algorithm to solve flow problems of non-Newtonian fluids such as solutions or melts of polymers. Many constitutive theories for such materials involve single integrals over the deformation history of the particle at the stress evaluation point; examples are the Doi-Edwards and Curtiss-Bird molecular theories and the BKZ family derived from continuum arguments. These theories are believed to be among the most accurate in describing non-Newtonian effects important to polymer process design. Effects such as stress relaxation, shear thinning, and normal stress effects. This research developed an optimized version of the algorithm which would run a factor of two faster than the pilot algorithm on scalar machines and would be able to take full advantage of vectorization on machines. Significant progress was made in code vectorization; code enhancement and streamlining; adaptive memory quadrature; model problems for the High Weissenberg Number Problem; exactly incompressible projection; development of multimesh extrapolation procedures; and solution of problems of physical interest. A portable version of the code is in the final stages of benchmarking and testing. It interfaces with the widely used FIDAP fluid dynamics package. (UHD)

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DESCRIPTORS: (U) \*COMPUTER PROGRAMMING, \*FLUID DYNAMICS, \*NONNEWTONIAN FLUIDS, \*VISCOELASTICITY, ALGORITHMS, CODING, DEFORMATION, FLOW, HISTORY, INCOMPRESSIBILITY, INTEGRALS, MELTS, SHEAR PROPERTIES, FINITE ELEMENT ANALYSIS, OPTIMIZATION, POLYMERS, PROBLEM SOLVING, BOUNDARY VALUE PROBLEMS, SCALAR FUNCTIONS, STRESS RELAXATION, STRESSES, TEST AND EVALUATION.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A9.

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CINCINNATI UNIV OH DEPT OF AEROSPACE ENGINEERING AND  
ENGINEERING MECHANICS IDENTIFIERS: (U) PE61102F, WUAFDSR2306A3.

(U) Interactions of Ultrasonic Waves with Composite Plates.

DESCRIPTIVE NOTE: Final rept. Dec 85-Dec 88.

MAR 89 65P

PERSONAL AUTHORS: Nayfeh, Adnan H.

CONTRACT NO. AFOSR-86-0052

PROJECT NO. 2306

TASK NO. A3

MONITOR: AFOSR  
TR-89-0462

UNCLASSIFIED REPORT

ABSTRACT: (U) We present a unified analytical treatment of the interaction of ultrasonic waves with single and multilayered arbitrarily oriented anisotropic elastic plates. The individual components forming the plate are allowed to possess up to as low as monoclinic symmetry. The plates are assumed to be immersed in a fluid and subjected to incident acoustic waves at arbitrary angles from the normal as well as at arbitrary azimuthal angles. Reflection and transmission coefficients are derived from which all propagation characteristics are identified. Highly complex reflection behavior, expressed as phase velocity-frequency dispersion, is observed as a consequence of anisotropy. Extensive comparisons with the concurrently acquired experimental data by Chimenti at the AFMIL on a variety of composite samples have been of unique help in assessing the validity of our theoretical modeling, and its potential application in the nondestructive evaluation of materials. Keywords: Fiber reinforced composites (AW)

DESCRIPTORS: (U) \*COMPOSITE STRUCTURES, \*PLATES, \*ULTRASONIC TESTS, ACOUSTIC WAVES, ELASTIC PROPERTIES, ANISOTROPY, ACOUSTIC REFLECTION, WAVE PROPAGATION, FREQUENCY, NONDESTRUCTIVE TESTING, FIBER REINFORCED COMPOSITES.

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two 2-D node planes are used: multifaceted holograms and multichannel incoherent image systems. (jhd)

(U) A Neural Network Approach to Model-Based Recognition.

DESCRIPTIVE NOTE: Annual rept. 1 Dec 87-1 Dec 88.

FEB 89 34P

DESCRIPTORS: (U) \*NEURAL NETS, \*PATTERN RECOGNITION, ALGORITHMS, DATA BASES, GRAPHS, HIERARCHIES, HOLOGRAMS, IMAGES, INPUT, LEARNING, MATCHING, MULTICHANNEL, MULTIPLEXING, NETWORK FLOWS, OPTICS, OPTIMIZATION, SPATIAL DISTRIBUTION, SPECIALIZATION, MASS STORAGE.

PERSONAL AUTHORS: Gindi, Gene R.

CONTRACT NO. F49620-88-C-0025

PROJECT NO. 2305

TASK NO. B1

MONITOR: AFOSR  
TR-89-0445

IDENTIFIERS: (U) PE61102F, WUAFOSR2305B1.

UNCLASSIFIED REPORT

ABSTRACT: (U) The problem of recognizing structured patterns (object recognition) is being pursued on several fronts. The main thrust of the work involves the design of networks that store some notion of a relational model of an object and performs recognition via a version of graph matching. This approach is governed by the use of objective functions to both specify the network and the problem to be solved. The dynamics of the net thus carry out an optimization procedure. Key here is the incorporation into the objective function of compositional and specialization hierarchy of models, and provision to perform dynamic grouping (perceptual organization) of the input data. Results so far show very good performance for versions where data is preprocessed into a form matchable to the database, but poorer performance on more difficult problems where the network must itself organize raw data into relational structures for matching. A related effort explores aspects of traditional associative memories that may be of use in more complex networks. Questions of performance, storage and robustness are addressed. A new fast learning algorithm is proposed for a CMAC network. Work in optical implementation of some of these networks constitutes a third front. The main problem here is to use optics to form a fixed interconnection network between layers of 2-D nodes (neurons). Two means of using spatial multiplexing to effect a 4-D interconnect between

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## BROWN UNIV PROVIDENCE RI DIV OF APPLIED MATHEMATICS

## CHEMICAL DYNAMICS CORP UPPER MARLBORO MD

(U) Impulsive Loading of Fiber-Reinforced Structures.

(U) Growth Studies of Metal-Metal/Semiconductor Structures.

DESCRIPTIVE NOTE: Final rept. 1 Feb 83-31 Dec 88.

DESCRIPTIVE NOTE: Final rept. 1 Aug 88-31 Jan 89.

MAR 89 23P

MAR 89 46P

PERSONAL AUTHORS: Kolsky, Herbert; Pipkin, Allen

PERSONAL AUTHORS: Murthy, C. S.; Rice, B. M.; Redmon, M. J.

CONTRACT NO. AFOSR-87-0157

CONTRACT NO. F49620-88-C-0086

PROJECT NO. 2302

PROJECT NO. 3005

TASK NO. C2

TASK NO. A1

MONITOR: AFOSR

TR-89-0469

MONITOR: AFOSR

TR-89-0461

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) The work described concerns the response of metallic composite beams and simple structures to rapid dynamic loading. It has been shown experimentally that the observed plastic response of clamped beam specimens to very sharp transverse blows could be adequately described by the idealised theory formulated by Spencer and his colleagues so long as the duration was sufficiently short for the plastic wave not to reach the clamp. The reflection process for real clamping conditions was found to very much more complex. The effects of blows of much longer durations on beams and portal arches are also described, as well as the effects of rate-of strain on the yield point of the matrix metal. Impact, Plastic waves, Strain rate effect, Structural response. (jes)

DESCRIPTORS: (U) \*COMPOSITE STRUCTURES, \*DYNAMIC LOADS, \*FIBER REINFORCEMENT, \*STRUCTURAL RESPONSE, ARCHES, BEAMS(STRUCTURAL), CLAMPS, IMPULSE LOADING, MATRIX MATERIALS, METALS, PLASTIC PROPERTIES, REFLECTION, SHARPNESS, STRAIN RATE, STRUCTURES, TRANSVERSE, WAVE PROPAGATION, WAVES, YIELD POINT, METAL MATRIX COMPOSITES.

IDENTIFIERS: (U) PE61102F, WUAFOSR2302C2.

ABSTRACT: (U) The overall goal of the research program is to develop an atomistic approach to gain an understanding of the mechanisms of growth processes and to contribute to the development of metal metal and metal semiconductor heterostructures. The Phase I research involved (i) reliable modelling of underlying atomic interactions within the atomic constituents of the substrate, interface, and adlayer; (ii) static and dynamical studies of interfacial energetics and kinetics. A survey of available schemes has been made and a strategy for our own future modelling efforts is identified. Keywords: Nickel, Copper. (MJM)

DESCRIPTORS: (U) \*COPPER, \*NICKEL, \*SEMICONDUCTORS, DYNAMICS, ENERGETIC PROPERTIES, GAIN, GROWTH(GENERAL), INTERFACES, METALS, STRUCTURES, SUBSTRATES.

IDENTIFIERS: (U) PE61102F, WUAFOSR3005A1.

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SCIENTIFIC RESEARCH ASSOCIATES INC GLASTONBURY CT

(U) Reciprocal Interactions of Hairpin-Shaped Vortices and a Boundary Layer.

DESCRIPTIVE NOTE: Final rept. 1 Feb 86-31 Dec 88.

DEC 88 296P

PERSONAL AUTHORS: Liu, N. S.; Shamroth, S. J.; McDonald, H.

REPORT NO. SRA-R88-910016-F

CONTRACT NO. F49620-86-C-0028

PROJECT NO. 3005

TASK NO. A1

MONITOR: AFOSR  
TR-89-0459

UNCLASSIFIED REPORT

ABSTRACT: (U) The role of hairpin vortices in cyclic production of wall turbulence has been studied in many laboratory experiments, primarily by using flow visualization. Study of hairpin vortices in a fully turbulent environment is greatly complicated by the presence of jitters and other co-existing structures. A viable approach for obtaining better understanding of the role of hairpin vortices in turbulence dynamics is to study the flow events stimulated by synthetically generated hairpin vortices in initially laminar boundary layers. This study simulates the flow dynamics stimulated by hairpin-shaped vortices in a boundary layer through the solution of time-dependent, three-dimensional, compressible Navier-Stokes equations. The numerical scheme used leads to temporal-spatial simulations and upon the effects of pressure gradient and compressibility on turbulence structure. Two simulations were carried out. In the first case, the initial condition contains only one imposed hairpin-shaped vortex; in the second, there are two incipient vortices separated by a short distance in the streamwise direction. Organized flow events; Three dimensional flow. (jes)

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DESCRIPTORS: (U) \*BOUNDARY LAYER, COMPRESSIBLE FLOW, COMPRESSIVE PROPERTIES, CYCLES, DYNAMICS, ENVIRONMENTS, FLOW, FLOW VISUALIZATION, FOCUSING, INTERACTIONS, LABORATORY TESTS, LAMINAR BOUNDARY LAYER, NAVIER STOKES EQUATIONS, NUMERICAL ANALYSIS, PRESSURE GRADIENTS, PRODUCTION, SHORT RANGE(DISTANCE), SIMULATION, SOLUTIONS(GENERAL), THREE DIMENSIONAL FLOW, TIME DEPENDENCE, TURBULENCE, VORTICES, WALLS.

IDENTIFIERS: (U) WUAFOSR3005A1, PE65502F.

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OHIO UNIV ATHENS DEPT OF MECHANICAL ENGINEERING

CALIFORNIA UNIV BERKELEY DEPT OF PSYCHOLOGY

(U) An Experimental Investigation of High Lift/High Rate Aerodynamics of an Unsteady Airfoil.

(U) Visual Information-Processing in the Perception of Features and Objects.

DESCRIPTIVE NOTE: Final rept. 1 Sep 87-31 Dec 88,

DESCRIPTIVE NOTE: Annual rept. no. 2, 1 Jan-31 Dec 88,

MAR 89 49P

JAN 89 157P

PERSONAL AUTHORS: Graham, G. M.

PERSONAL AUTHORS: Treisman, Anne

CONTRACT NO. AFOSR-87-312

CONTRACT NO. AFOSR-87-0125

PROJECT NO. 2307

PROJECT NO. 2313

TASK NO. A3

TASK NO. A4

MONITOR: AFOSR  
TR-89-0438MONITOR: AFOSR  
TR-89-0403

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) An experimental study of a two dimensional NACA 0015 airfoil undergoing both positive and negative constant pitch rate motions at high angles of attack was conducted in the Ohio University tow tank facility. Nondimensional pitch rates in the range of  $0.1 < K < 0.7$  and Reynolds numbers in the range of  $141,000 < Re < 342,000$  were considered. Test results consist of lift and drag force coefficients and flow visualizations. The results of this study provide insight into the airfoil-dynamic stall vortex interaction during the pitch down motion and the cessation of aerodynamic stall. These data may be useful in high angle of attack applications such as the enhanced maneuverability concept for fighter aircraft. Keywords: Unsteady aerodynamics, Pitching airfoils, Maneuverability. (EDC)

DESCRIPTORS: (U) \*AIRFOILS, \*STALLING, AERODYNAMIC CHARACTERISTICS, AERODYNAMIC FORCES, AERODYNAMIC LIFT, ANGLE OF ATTACK, COEFFICIENTS, AERODYNAMIC DRAG, JET FIGHTERS, FLIGHT MANEUVERS, FLOW VISUALIZATION, HIGH ANGLES, HIGH LIFT, HIGH RATE, INTERACTIONS, MANEUVERABILITY, PITCH(MOTION), REYNOLDS NUMBER, TEST AND EVALUATION, UNSTEADY FLOW, VORTICES.

IDENTIFIERS: (U) NACA-0015 airfoils, Unsteady aerodynamics, Dynamic stall, PEG1102F, WUAFOSR2307A3.

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ABSTRACT: (U) This research supported by my grant from AFOSR this year completed some of the projects outlined in the first annual report and initiated some new ones. The focus remained on the visual processing of features and objects, the role of spatial attention and the representation of complex visual patterns in perception and memory. Studies of visual search explored the coding of features at potentially more abstract levels than simple luminance filters. Among the features studied were orientation (for lines, dot pairs and edges), orientation and size (for shapes whose boundaries were defined by discontinuities of texture, motion and depth), and illusory contours. Another series of experiments tested the mechanisms underlying the coding of feature conjunctions, using evidence from search latencies and illusory conjunction errors. The results led to a proposed revision of my earlier feature integration theory. Two other studies looked at memory for visual patterns. One studied the effects of prolonged practice (thousands of trials) on the coding of visual patterns. At the other extreme, an experiment explored the effects on memory just one to five presentations of similar patterns. In both cases, we found striking specificity in the coding of these meaningless shapes and in their effects on subjects' later experiences with the same stimuli. Patterned conjunctions of lines, once formed,

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appear to persist in visual memory and to facilitate their later re-perception provided that the same task and context are also reinstated. Keywords: Attention. (aw)

DESCRIPTORS: (U) \*ATTENTION, \*MEMORY(PSYCHOLOGY), \*VISUAL PERCEPTION, CODING, DISCONTINUITIES, FILTERS, IMAGE PROCESSING, INFORMATION PROCESSING, INTEGRATION, LUMINANCE, OPTICAL IMAGES, PATTERNS, SEARCHING, SPATIAL DISTRIBUTION, STIMULI, TEXTURE, THEORY, VISION, SPACE PERCEPTION, ILLUSIONS.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2313A4.

OREGON STATE UNIV CORVALLIS DEPT OF ELECTRICAL AND COMPUTER ENGINEERING

(U) Point Defects in Semiconductors: Microscopic Identification, Metastable Properties, Defect Migration, and Diffusion.

DESCRIPTIVE NOTE: Final technical rept. 31 Aug 86-31 Mar 89,

MAR 89 135P

PERSONAL AUTHORS: Van Vechten, James A.; Wager, John F.

CONTRACT NO. AFOSR-86-0309

PROJECT NO. 2306

TASK NO. B1

MONITOR: AFOSR  
TR-89-0402

UNCLASSIFIED REPORT

ABSTRACT: (U) The goal of the research program described herein was to provide insight into the identity and properties of point defects in semiconductors. Particular emphasis was devoted to problems involving microscopic identification, metastable properties, defect migration, and diffusion of point defects in semiconductors. Our approach was to apply atomistic thermodynamic theory, Monte Carlo simulation, and experimental analysis to elucidate the nature and properties of semiconductor defects. Significant progress has been made in the following seven areas: 1) recombination enhanced vacancy migration in silicon, 2) Monte Carlo simulation of diffusion in semiconductors, 3) phosphorous vacancy nearest-neighbor hopping in InP, 4) entropy of migration for atomic hopping, 5) EL2/ELO identification in GaAs, 6) characterization and identification of DX in AlGaAs, and 7) temperature dependence of band offsets

DESCRIPTORS: (U) \*SEMICONDUCTORS, MIGRATION, ENTROPY, DIFFUSION, METASTABLE STATE, MICROSCOPY, SIMULATION, THERMODYNAMICS, SILICON.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2306B1.

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AD-A206 946 CONTINUED

PRINCETON UNIV NJ DEPT OF MECHANICAL AND AEROSPACE  
ENGINEERING

(U) Charged Slurry Droplet Research.  
\*SLURRIES, \*SPRAYS, ATOMIZATION, ELECTROMETERS,  
EVAPORATION, IMAGES, MASS SPECTROMETERS, PHASE  
TRANSFORMATIONS, QUADRUPOLE MOMENT, STATIC ELECTRICITY,  
TRANSIENTS, VIDEO FRAMES.

DESCRIPTIVE NOTE: Final rept. 1 Oct 86-30 Sep 88.

IDENTIFIERS: (U) PE61102F, WUAFOSR2308A2.

FEB 89 201P

PERSONAL AUTHORS: Kelly, A. J.

REPORT NO. MAE-1855

CONTRACT NO. AFOSR-86-0013

PROJECT NO. 2308

TASK NO. A2

MONITOR: AFOSR  
TR-89-0406

UNCLASSIFIED REPORT

ABSTRACT: (U) Rayleigh Bursting, wherein critically charged droplets explosively expel a number of micron sized 'sibling' droplets, enhances atomization and combustion of all liquid fuels. Droplet surface charge is retained during evaporation, permitting multiple Rayleigh Bursts to occur. Moreover, the charge is available for the deagglomeration of residual particulate flocs from slurry droplet evaporation. To fill gaps in our knowledge of these processes, an experimental program involving the use of a charged droplet levitator and a quadrupole mass spectrometer, high speed electrometer (QMS/HSE) has been undertaken to observe the disruption and to measure quantitatively the debris. A charged droplet levitator based on a new video frame grabber technology to image transient events, is described. Sibling droplet size is ten microns or less and is close to, if not coincident with, the predicted phase transition in droplet charging level. The research effort has focused on the exploration of this transition and its implications. Keywords: Charged droplets; Rayleigh bursting; Droplet charging behavior; Charged sprays; Droplet levitation; Quadrupole mass spectrometer. (MUM)

DESCRIPTORS: (U) \*COMBUSTION, \*DROPS, \*FUELS, \*LIQUIDS,

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CONTINUED

(U) Dynamics of Excited High-Lying States of H<sub>2</sub> and D<sub>2</sub>

DESCRIPTIVE NOTE: Final rept. 5 May 86-4 Oct 88.

NOV 88

76P

PERSONAL AUTHORS: Kachru, R.; Helm, H.

REPORT NO. SRI-MP-88-234

CONTRACT NO. F49620-86-K-0017

PROJECT NO. 2301

TASK NO. A4

MONITOR: AFOSR  
TR-89-0474

IDENTIFIERS: (U) PE61102F, WUAFOSR2301A4, LPN SRI-PYU-2197.

EXPERIMENTAL DATA, INTERACTIONS, IONIZATION, IONS, LASER PUMPING, LASERS, MODELS, MOLECULES, PARTICLE COLLISIONS, PHOTODISSOCIATION, PHOTOIONIZATION, PROTOTYPES, ROTATION, SPECTROSCOPY.

UNCLASSIFIED REPORT

ABSTRACT: (U) The spectroscopy and dynamics of Rydberg states of molecular hydrogen is important in modeling discharge and electron beam pumped lasers, molecular ion electron collisions, and the photoionization of molecular hydrogen. Our primary objective was to investigate the excited states of H<sub>2</sub> and D<sub>2</sub> as two prototypes for a systematic study of manifestations of the static and dynamic interactions governing molecular Rydberg states. Our experimental approach employed a stepwise laser excitation scheme. Detection of the charged molecular, atomic fragments and the energy-analyzed electrons enabled us to measure autoionization, ionization, dissociation, and the competition between them. We studied and analyzed the np autoionizing Rydberg states in H<sub>2</sub>. We also studied the competition between photoionization and photodissociation from the C111uH<sub>2</sub> state. In addition, we performed the first study of the onset of field ionization and the forced rotational autoionization of the np Rydberg states. We demonstrated that the ionization process can be described classically. Hydrogen; Deuterium. (MJM)

DESCRIPTORS: (U) \*DEUTERIUM, \*DYNAMICS, \*EXCITATION, \*HYDROGEN, APPROACH, DETECTION, DISSOCIATION, ELECTRIC FIELDS, ELECTRON BEAMS, ELECTRONS, ELEMENTARY PARTICLES,

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## TEXAS UNIV AT ARLINGTON COMPUTATION FLUIDS DYNAMICS CENTER

## BOSTON UNIV MA CENTER FOR ADAPTIVE SYSTEMS

(U) Development of Adaptive Grid Schemes Based on Poisson Grid Generators.

(U) Solving the Brightness-from-Luminance Problem: A Neural Architecture for Invariant Brightness Perception.

DESCRIPTIVE NOTE: Final rept. 15 May 85-14 Nov 80.

DESCRIPTIVE NOTE: Interim rept..

JAN 89 60P

FEB 89 39P

PERSONAL AUTHORS: Anderson, Dale A.

PERSONAL AUTHORS: Grossberg, Stephen; Todorovic, Dejan

REPORT NO. UTA-CFD-89-02

CONTRACT NO. F49620-86-C-0037, F49620-87-C-0018

CONTRACT NO. AFOSR-85-0195

PROJECT NO. 2131

PROJECT NO. 2307

TASK NO. A5

TASK NO. A1

MONITOR: AFOSR  
TR-89-0457MONITOR: AFOSR  
TR 89-0217

UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) Poisson equation grid generators are the most popular differential equation mesh generation schemes. Results reported under this program show how to use the existing schemes to construct adaptive grids. Methods for controlling individual arc lengths as well as cell volumes are given and technique for constructing two-dimensional orthogonal adaptive grids are included. Adaptivity was also demonstrated with unstructured meshes using the Poisson equation as a control on grid point location. Additional adaption schemes for unstructured grids presented using a linear spring analogy. (KR)

DESCRIPTORS: (U) DIFFERENTIAL EQUATIONS, POISSON DENSITY FUNCTIONS, POISSON EQUATION, ADAPTIVE SYSTEMS, ANALOGIES, GENERATORS, GRIDS, GRIDS(COORDINATES), MESH, ORTHOGONALITY, TWO DIMENSIONAL.

IDENTIFIERS: (U) PE611021, WUAFOSR2307A1, Linear spring analogy

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ABSTRACT: (U) The spatial distribution of light that constitutes the input to our eyes is the foundation of all visual functions, such as perception of brightness, color, texture, form, and 3-D organization. The perception of brightness may perhaps appear to be the simplest of all functions. The most natural initial explanation of why surface A appears brighter than surface B is that more light arrives into our eyes from surface A than from B. However, as we will show in the following, the relation of luminance (which is a physical variable involving the amount of light energy arriving at the retina) and brightness (which is a psychological variable denoting perceived intensity of light) is much more complicated. The brightness-from luminance problem is the following: find the mapping that transforms any given spatial distribution of luminance into the corresponding spatial distribution of brightness. The problem is generally solved for the simple visual situation involving a bright patch on a dark background. Increasing the luminance of the patch causes it to look increasingly brighter, but in a nonlinear manner. In more complicated visual situations contained by several surfaces, their brightnesses may be predicted by taking logarithms, or power functions, of their luminance. To summarize, there are at least two factors that make the relation of

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AD-A206 883 20/5

brightness and luminance a problem: Illumination discounting and contextual dependence. We will present a neural network architecture that deals with both issues. Keywords: Mathematical models. (KT/AW)

DESCRIPTORS: (U) \*BRIGHTNESS, \*VISUAL PERCEPTION, \*CYBERNETICS, \*LUMINANCE, \*MATHEMATICAL MODELS, ARCHITECTURE, BACKGROUND, DARKNESS, ENERGY, EYE, FUNCTIONS, ILLUMINATION, INTENSITY, INVARIANCE, LIGHT, NERVOUS SYSTEM, NEURAL NETS, OPTICAL IMAGES, PERCEPTION, POWER, RETINA, SPATIAL DISTRIBUTION.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2131A5, \*Neural nets.

STATE UNIV OF NEW YORK AT BUFFALO DEPT OF CHEMISTRY

(U) Nonlocal and Quasilocal Potentials in the Spontaneous Emission of Molecular Exciplexes Coupled to the Phonon Bath of a Solid Matrix.

JAN 89

PERSONAL AUTHORS: Lam, Kai-Shue; George, Thomas F.

CONTRACT NO. F49620-86-C-0009, N00014-86-K-0043

PROJECT NO. 2303

TASK NO. 83

MONITOR: AFOSR  
TR-89-0465

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Chemical Physics, v90  
n2 p1048-1060, 15 Jan 89.

ABSTRACT: (U) Molecular exciplexes coupled to the phonon-bath of a solid matrix are treated by a two-state model allowing for radiative relaxation from the excited to ground a state and thermal relaxation from each of the state to the phonon bath. Molecular dynamics is considerably simplified by a canonical (Duke-Soules) transformation on the model Hamiltonian. This transformation (i) re-normalizes the bath-free exciplex potential surfaces to phonon-dressed surfaces and (ii) combines the radiative and phonon couplings into a single effective coupling. This leads to an effective nonlocal potential whose kernel is a product of radiative and nonradiative parts, and which can be interpreted pictorially in an intuitive manner when individual terms in the Born series solution of the corresponding Schrodinger equation are linked to special 'Feynman diagrams'. Under the small phonon-energy and the weak correlation (between phonon and nuclear degrees of freedom) approximations, a thermally-averaged wave function for nuclear motion can be constructed, and the nonlocal potential reduces to a quasilocal potential in which the phonon bath 'filters out' certain nonlocal transitions between the exciplex states. Keywords: Molecular exciplexes; Solid matrix; Phonon bath;

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Radiative relaxation; Thermal relaxation; Theory;  
Reprints. (JHD)

BOSTON UNIV MA

DESCRIPTORS: (U) \*MOLECULAR ENERGY LEVELS. \*RELAXATION.  
CORRELATION. COUPLINGS. DYNAMICS. EMISSION. SOLID STATE  
PHYSICS. HAMILTONIAN FUNCTIONS. LOW STRENGTH. MODELS.  
MOLECULAR PROPERTIES. PHONONS. RADIATION. REPRINTS.  
SCHRÖDINGER EQUATION. SERIES(MATHEMATICS).  
SOLUTIONS(GENERAL). THERMAL PROPERTIES. TRANSITIONS.

(U) Magnetosphere - Thermosphere Coupling: An Experiment  
in Interactive Modeling.

MAR 89 16P

PERSONAL AUTHORS: Forbes, Jeffrey M.; Harel, Moshe

CONTRACT NO. AFOSR-85-0048

PROJECT NO. 2310

TASK NO. A2

MONITOR: AFOSR  
TR-89-0467

IDENTIFIERS: (U) WUAFOSR2303B3, PE61102F, Duke Soules  
transformations. Feynman diagrams. \*Molecular exciplexes.  
Phonon baths.

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Geophysical Research,  
v94 nA3 p2631-2644, 1 Mar 89.

ABSTRACT: (U) The Rice convection model (RCM) is  
utilized to investigate the electrodynamic coupling  
between the inner magnetosphere and the thermosphere  
including the effects of EUV-and convection-driven  
neutral winds under quasi-equilibrium conditions. It is  
shown that the parameters determining the coupling are  
the Pedersen and Hall effective winds, which are the  
height integrals of the respective conductivity-weighted  
wind profiles divided by the respective layer  
conductivities. Their appearance in the RCM is equivalent  
to a two-slab formulation whereby the integrated Hall  
conductivity originates in the lower slab, the integrated  
Pedersen conductivity originates in the upper slab, and  
the height dependence of the neutral wind is accounted  
for by assuming different wind vectors for the lower and  
upper slab. A unique aspect of the study is that the  
convection-driven winds are included self-consistently  
and interactively; that is, a steady state wind  
parameterization is written analytically in terms of the  
electrostatic potential, which is in turn included in a  
closed-loop calculation for the electric potential itself.  
During the early phases of the disturbance when the  
normal shielding from high latitudes breaks down, the  
neutral winds do not modify appreciably the disturbance  
electric fields at middle and low altitudes. As the

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system approaches a quasi-equilibrium state, the neutral winds play a much more significant role. By comparison with the 'no-wind' simulation, the fields driven by EUV winds counteract the fields of magnetospheric origin and given the appearance of a shielding effect. Reprints. (JHD)

BOSTON UNIV MA

(U) A Fully Analytic, Low- and Middle-Latitude Ionospheric Model,

FEB 89 6P

DESCRIPTORS: (U) \*COUPLING(INTERACTION), \*INTERACTIONS, \*MAGNETOSPHERE, \*THERMOSPHERE, CLOSED LOOP SYSTEMS, COMPUTATIONS, ELECTRICAL CONDUCTIVITY, CONVECTION, ELECTRIC FIELDS, ELECTRICITY, ELECTRODYNAMICS, ELECTROSTATICS, HALL EFFECT, INTEGRALS, INTEGRATED SYSTEMS, LAYERS, LOW ALTITUDE, IONOSPHERIC MODELS, NEUTRAL, REPRINTS, ELECTROMAGNETIC SHIELDING, STEADY STATE, VOLTAGE, WIND.

PERSONAL AUTHORS: Anderson, David N.; Forbes, Jeffrey M.; Codrescu, Mihail

CONTRACT NO. AFOSR-85-0048

PROJECT NO. 2310

TASK NO. A2

IDENTIFIERS: (U) RCM(Rice Convection Model), Pedersen conductivity, Hall conductivity, Neutral winds, WUAFOSR2310A2, PE61102F.

MONITOR: AFOSR TR-89-0466

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Geophysical Research, v94 nA2 p1520-1524, 1 Feb 89.

ABSTRACT: (U) A fully analytic ionospheric model emphasizing the low latitude F region for various seasonal and solar cycle conditions is presented. Features such as the post-sunset rise in the F layer peak height and the 'equatorial anomaly' maxima in plasma density near + or - deg geomagnetic latitude are designed to closely approximate those in the semiempirical low-latitude ionospheric model. Significant improvements are thus obtained over previous comparable analytic models. Numerical computations are also presented which demonstrate the importance of these large-scale plasma structures to the neutral dynamics of the low-latitude thermosphere. Equally significant effects are anticipated for the electrodynamical simulations of E region/F region coupling involving flux tube integrated electrical conductivities. Keywords: Ionosphere; Model; Low latitude; Reprints. (JHD)

DESCRIPTORS: (U) \*F REGION, \*IONOSPHERIC MODELS, ANOMALIES, COMPUTATIONS, DENSITY, DYNAMICS, ELECTRODYNAMICS, EQUATORIAL REGIONS, HEIGHT, IONOSPHERE, MATHEMATICAL MODELS, NEUTRAL, NUMERICAL ANALYSIS, PEAK VALUES, PLASMA(Physics), REPRINTS, SEASONAL VARIATIONS, SIMULATION, SOLAR CYCLE, STRUCTURES.

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IDENTIFIERS: (U) WUAFOSR2310A2, PE61102F.

UNITED TECHNOLOGIES RESEARCH CENTER EAST HARTFORD CT

(U) The Pyrolysis of Acetylene Initiated by Acetone.

DESCRIPTIVE NOTE: Rept. for Feb 87-Jul 88,

89 22P

PERSONAL AUTHORS: Colket, M. B., III; Seery, D. J.;  
Palmer, H. B.

CONTRACT NO. F49620-85-C-0012, F49620-88-C-0051

PROJECT NO. 2308

TASK NO. A2

MONITOR: AFOSR  
TR-89-0456

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Combustion and Flame, v75  
p343-366 1989.

ABSTRACT: (U) A detailed, radical chain mechanism is used to model the pyrolysis of acetylene near 1000 K. The initiation process,  $C_2H_2 + C_2H_2$  yields  $C_4H_3 + H$ , appears to be inconsistent with thermochemistry. Since experimental evidence indicates the presence of a chain mechanism, alternative sources of initiation are considered. Acetone, a common impurity in purified acetylene, was found to dominate radical initiation during the pyrolysis of acetylene near 1000K despite concentration levels on ly 0.1% that of acetylene. Modeling results compare favorably with the experimental results of Munson and Anderson for acetylene decay and the formation of products vinyl acetylene, benzene, and ethylene. Rate constants were adjusted to optimize the fit of the experimental data. A sensitivity analysis shows that the computed results were most sensitive to rate constants for these and a few other reactions. Keywords: Acetylene pyrolysis, Radical initiation, Effects, Acetone impurities, Reprints. (MUM)

DESCRIPTORS: (U) \*ACETONES, \*ACETYLENE, \*PYROLYSIS, BENZENE, CHAINS, CONSTANTS, DECAY, ETHYLENE, EXPERIMENTAL DATA, IMPURITIES, MODELS, PURIFICATION, RATES, REPRINTS,

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SENSITIVITY, SOURCES, THERMOCHEMISTRY.

MICHIGAN STATE UNIV EAST LANSING DEPT OF PEDIATRICS/  
HUMAN DEVELOPMENT

IDENTIFIERS: (U) WUAFOSR2308A2, PE61102F.

(U) Dieldrin Inhibition of Gap Junctional Intercellular  
Communication in Rat Glial Cells as Measured by the  
Fluorescence Photobleaching and Scrape Loading/Dye  
Transfer Assays.

87 11P

PERSONAL AUTHORS: Trosko, James E.; El-Fouly, Mohamed H.;  
Suter, S.; Lockwood, L. R.; Koestner, A.

CONTRACT NO. AFOSR-86-0084

PROJECT NO. 2312

TASK NO. A5

MONITOR: AFOSR  
TR-89-0450

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Fundamental and Applied  
Toxicology. v9 p785-794 1987.

ABSTRACT: (U) Application of the fluorescence-recovery  
after photobleaching (FRAP analysis) technique and scrape  
loading/dye transfer assay was made to measure the  
presence of gap junctional communication in primary rat  
glial cells in vitro in the presence and absence of the  
neurotoxicant and tumor promoter dieldrin, a chlorinated  
insecticide. Results demonstrate that primary rat glial  
cells are able to exhibit gap junctional intercellular  
communication and that dieldrin at noncytotoxic  
concentrations can modulate gap junctional communication  
as early as 10 min after exposure to the chemical and  
that the effect is reversible after 4 hr recovery from  
the dieldrin exposure. Both the FRAP analysis and the  
scrap loading/dye transfer assay have validated the  
observation that dieldrin inhibits gap junctional  
communication in other cell types using different  
techniques to measure gap junction function. These  
results were interpreted as an indication that inhibition  
of gap junctional communication might contribute to the  
cellular mechanism of dieldrin's neurotoxicity. Reprints.  
(aw)

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MICHIGAN STATE UNIV EAST LANSING DEPT OF PEDIATRICS/  
HUMAN DEVELOPMENT

DESCRIPTORS: (U) \*NERVE CELLS, \*DIELDRIN, \*TOXICITY,  
BIOASSAY, CHLORINATION, DYES, EXPOSURE (PHYSIOLOGY),  
INHIBITION, INSECTICIDES, NEOPLASMS, NERVOUS SYSTEM,  
REPRINTS, TRANSFER, NERVE BLOCKING, CARCINOGENS.

(U) Nongenotoxic Mechanisms in Carcinogenesis: Role of  
Inhibited Intercellular Communication,

IDENTIFIERS: (U) WUAFOSR2312AS, PE61102F, \*Gap  
junctional intercellular communication, \*Glial cells,  
Photobleaching, Scrape loading, Tumor promoters,  
Neurotoxicity, Intercellular communication.

88 33P

PERSONAL AUTHORS: Trosko, James E.; Chang, Chia-ChengM

CONTRACT NO. AFOSR-86-0084

PROJECT NO. 2312

TASK NO. A5

MONITOR: AFOSR  
TR-89-0454

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Carcinogen Risk Assessment,  
n31 p139-170 1988.

ABSTRACT: (U) Carcinogenesis is a multistep process,  
involving several distinct mechanisms, involving the  
conversion of a normal stem-like cell to a cell resistant  
to terminal differentiation (i.e., initiation), followed  
by the clonal expansion of this initiated cell (i.e.,  
promotion), during which time additional changes occur  
allowing the cell to become malignant (i.e., progression).  
Each of these distinct operational stages of  
carcinogenesis probably involves mechanisms (i.e., many  
mechanisms for initiation and promotion). Since gene and  
chromosomal mutations, cell death, and modulation of gene  
expression are the biological consequences of chemical  
exposure, many genetic, biological, and environmental  
factors can modulate how a given chemical can induce  
these changes. The general paradigm of 'carcinogenesis as  
mutagens' is considered totally inadequate to design the  
test protocol for animal bioassays and to interpret the  
data from these tests. The role of inhibited  
intercellular communication has been postulated to play a  
role in the tumor promotion and progression phases.  
Examination of experimental results of known tumor  
promotes as inhibitors of intercellular communication is  
presented. Implications of these results suggest a new  
paradigm is needed to approach the problem of a

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'biological risk assessment' model. 'Science progresses more by the introduction of new world views or 'pictures' than by the steady accumulation of information.' Reprints. (AW)

MICHIGAN STATE UNIV EAST LANSING DEPT OF PEDIATRICS/  
HUMAN DEVELOPMENT

(U) Chemical and Oncogene Modulation of Gap Junctional  
Intercellular Communication.

DESCRIPTORS: (U) \*CARCINOGENESIS. \*CELLS(BIOLOGY),  
\*NEOPLASMS, ACCUMULATION, ANIMALS, BIOASSAY, BIOLOGY,  
CHEMICALS, CHROMOSOMES, COMMUNICATION AND RADIO SYSTEMS,  
DEATH, ENVIRONMENTS, EXPOSURE(PHYSIOLOGY), GENES, GLOBAL,  
INHIBITORS, MODELS, MODULATION, MUTAGENS, MUTATIONS,  
RESISTANCE, RISK, STEADY STATE.

88 16P

PERSONAL AUTHORS: Trosko, James E.; Chang, Chia-Cheng

CONTRACT NO. AFOSR-86-0084

IDENTIFIERS: (U) WUAFOSR2312A5, PE61102F, \*Intercellular  
communication, Stem cells, Tumor promoters, Nongenotoxic  
agents.

PROJECT NO. 2312

TASK NO. A5

MONITOR: AFOSR  
TR-89-0447

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Tumor Promoters: Biological  
Approaches for Mechanistic Studies and Assay Systems, p97-  
111 1988.

ABSTRACT: (U) In this report, we will present chemical  
modulation of gap junctional intercellular communication  
as a cellular mechanism of chemical toxicity which could  
lead to a wide variety of harmful endpoints. We and  
others have postulated that chemical modulation of gap  
junctional communication can lead to carcinogenesis,  
promote initiated cells during carcinogenesis, cause  
neurotoxic effects, bring about reproductive dysfunction  
and other dysfunctional physiological states. Gap  
junctional communication appears to be an important  
biological process involved in the regulation of  
proliferation, differentiation and adaptive responses of  
differentiated cells. The process of gap junctional-  
intercellular is operationally dependent on a cell's  
ability to recognize and 'dock' with another cell, to  
organize the gap junction subunits into functional  
channels, to transfer regulatory ions and small molecules  
and to have appropriate subcellular components to respond  
to these regulatory signals. The biophysical/biochemical  
chemical nature of the gap junction structure, while not  
yet unequivocally delineated, seems to be modulated by  
several important factors, including  $Ca^{++}$ , pH, C-AMP,  
voltage changes, and temperature. Endogenous and

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exogenous chemicals have been shown to affect gap junction structure/function. Reprints. (aw)

MICHIGAN STATE UNIV EAST LANSING DEPT OF PEDIATRICS/HUMAN DEVELOPMENT

DESCRIPTORS: (U) \*CELLS(BIOLOGY), \*CHEMICALS, \*TERATOGENIC COMPOUNDS, \*TOXICITY, ADAPTATION, BIOLOGY, CHANNELS, CHEMICAL AGENTS, DYSFUNCTION, MODULATION, MOLECULES, PHYSIOLOGICAL EFFECTS, REPRINTS, REPRODUCTION(PHYSIOLOGY), RESPONSE(BIOLOGY), VOLTAGE, CALCIUM, PH FACTOR, ADENOSINE PHOSPHATES.

(U) Effects of Hepatic Tumor Promoters Phenobarbital and Polybrominated Biphenyls on Intercellular Communication between Rat Liver Epithelial Cells.

88 15P

IDENTIFIERS: (U) WUAFOSR2312A5, PEG1102F, \*Gap junctional intercellular communication, \*Oncogenes, Chemical modulation, Neurotoxicity, Intercellular communication.

PERSONAL AUTHORS: Trosko, James E.; Rezabek, Margit S.; Jone, Cyrenius; Sleight, Stuart D.

CONTRACT NO. AFOSR-86-0084

PROJECT NO. 2312

TASK NO. A5

MONITOR: AFOSR TR-89-0446

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Molecular and Cellular Toxicology, v2 n1 p45-58 1988.

ABSTRACT: (U) FireMaster BP-6 (FM), a mixture of polybrominated biphenyls, and phenobarbital (PB) promote hepatic carcinogenesis in rats. Inhibition of intercellular communication is a possible mechanism of tumor promotion. Vitamin A compounds, such as retinyl acetate (RA), antagonize the carcinogenic process in some systems. In this study, FM, PB and RA were tested in two intercellular communication assays using a rat liver epithelial cell line (WB-F344). One assay measured inhibition of metabolic cooperation (MC) between cells containing the enzyme hypoxanthine-guanine phosphoribosyl transferase and mutant cells lacking the enzyme. The other assay evaluated the inhibition of fluorescence redistribution after photobleaching (FRAP), which occurs through gap junctions between cells loaded with a fluorescent dye. The hepatic tumor promoter PB inhibited MC, but did not block junctional communication in the FRAP assay. The hepatic tumor promoter FM inhibited MC and also blocked FRAP. Retinyl acetate blocked MC did not inhibit FRAP, and had no effect on the ability of FM to block junctional communication in the MC or FRAP assays. Reprints. (aw)

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MICHIGAN STATE UNIV EAST LANSING DEPT OF PEDIATRICS/  
HUMAN DEVELOPMENT

DESCRIPTORS: (U) \*BARBITURATES, \*BIPHENYL,  
\*CARCINOGENESIS, \*CELLS(BIOLOGY), \*EPITHELIUM, \*LIVER,  
\*BROMINE COMPOUNDS, BIOASSAY, CARCINOGENS, COOPERATION,  
DISTRIBUTION, ENZYMES, FLUORESCENCE, FLUORESCENT DYES,  
INHIBITION, METABOLISM, MUTATIONS, NEOPLASMS, RATS,  
REPRINTS.

(U) A Failed Paradigm: Carcinogenesis Is More Than  
Mutagenesis.

88 3P

IDENTIFIERS: (U) WUAFOSR2312A5, PE61102F, \*Intercellular  
communication, \*Phenobarbital, \*Polybrominated biphenyls,  
Gap junctional intercellular communication, Firemaster BP-  
6, Tumor promoters, Photobleaching, Retinyl acetate.

PERSONAL AUTHORS: Trosko, James E.

CONTRACT NO. AFOSR-86-0084

PROJECT NO. 2312

TASK NO. A5

MONITOR: AFOSR  
TR-89-0453

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Mutagenesis, v3 n4 p363-366  
1988.

ABSTRACT: (U) An important series of recent assessments  
related to carcinogen/mutagen screening strategies and  
the evaluation of predictability of carcinogenicity from  
short term 'genotoxicity' tests (STT) have appeared.  
Further studies based on the acceptance of the  
assumptions of the current bioassay protocol, on the  
unchallenged acceptance of the STTs ability to measure  
only mutations, and reluctance to recognize non-mutagenic  
mechanisms such as cytotoxicity and altered gene  
expression through modulated intercellular communication  
mechanisms, will only produce more of the same kind of  
uninterpretable data. Carcinogenesis is more than  
mutagenesis and not all chemicals detected as 'positive'  
in short-term assays designed to detect mutagens are, in  
fact, mutagenic. In addition, many carcinogens detected  
in animal bioassays are clearly not mutagenic. Until the  
role of chemical-induced cytotoxicity and non-genotoxic  
or epigenetic mechanisms are accounted for, evaluations  
of the relevance of either the STTs and bioassay results  
will remain quite dubious. Reprints. (AW)

DESCRIPTORS: (U) \*CARCINOGENESIS, \*CELLS(BIOLOGY),  
\*MUTATIONS, ANIMALS, BIOASSAY, CARCINOGENS, CHEMICALS,  
GENES, MODULATION, MUTAGENS, PREDICTIONS, REPRINTS, SHORT

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RANGE(TIME).

MICHIGAN STATE UNIV EAST LANSING DEPT OF PEDIATRICS/  
HUMAN DEVELOPMENT

IDENTIFIERS: (U) WUAFOSR2312A5, PEG1102F, \*Mutagenesis,  
Genotoxicity, Intercellular communication, Cytotoxicity,  
Nongenotoxic agents.

(U) Anchored Cell Analysis/Sorting Coupled with the Scrape-  
Loading/Dye-Transfer Technique to Quantify Inhibition  
of Gap-Junctional Intercellular Communication in WB-  
F344 Cells by 2,2',4,4', 5,5'-Hexabromobiphenyl.

88

PERSONAL AUTHORS: Trosko, James E.; Evans, Mark G.; El-  
Fouly, Mohamed H.; Sleight, Stuart D.

CONTRACT NO. AFOSR-86-0084

PROJECT NO. 2312

TASK NO. A5

MONITOR: AFOSR  
TR-89-0449

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Toxicology and  
Environmental Health, v24 p261-271 1988.

ABSTRACT: (U) Inhibition of intercellular communication  
has been hypothesized to play a role in tumor promotion.  
The compound 2,2', 4,4', 5,5' -hexabromobiphenyl (245-HBB)  
is a tumor promoter in vivo and blocks inter-cellular  
communication in vitro. The scrape-loading/dye-transfer  
(SL/DT) assay was used to assess this in vitro effect at  
varying concentrations of 245-HBB. The SL/DT technique is  
based on the inter-cellular loading of a fluorescent dye,  
lucifer yellow (LY), and monitoring its transfer into  
adjacent cells via patent gap junctions. Confluent WB-  
F344 (rat epithelial) cells were exposed to various non-  
cytotoxic concentrations of 245-HBB. Transfer of LY was  
then quantified with anchored cell analysis/sorting. The  
results indicate an inverse correlation between the  
degree of fluorescence in secondary LY-recipient cells  
and the treatment concentration. The coupling of these  
two new methods of cellular biology provided rapid  
quantitative analysis of dye transfer in measuring the  
concentration/response of modulation of gap-junctional  
permeability in cultured cells. Keywords: Toxicity,  
Reprints. (AW)

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MICHIGAN STATE UNIV EAST LANSING DEPT OF PEDIATRICS/  
HUMAN DEVELOPMENT

DESCRIPTORS: (U) \*CELLS(BIOLOGY), \*CARCINOGENS,  
\*BIPHENYL, \*BROMINE COMPOUNDS, CORRELATION, CYTOLOGY,  
DYES, FLUORESCENCE, FLUORESCENT DYES, IN VITRO ANALYSIS,  
IN VIVO ANALYSIS, INHIBITION, INVERSION, MODULATION,  
NEOPLASMS, QUANTITATIVE ANALYSIS, RATS, REPRINTS, SORTING,  
TOXICITY, TRANSFER.

IDENTIFIERS: (U) WUAFOSR2312A5, PEG1102F, \*Gap  
junctional intercellular communication,  
\*Hexabromobiphenyls, Biphenyl/2,2,4,4,5,5-hexabromo,  
Tumor promoters, Lucifer yellow dyes,, Intercellular  
communication.

88 6P

PERSONAL AUTHORS: Trosko, James E.; Madhukar, Burra V.;  
Oh, Saw Y.

CONTRACT NO. AFOSR-86-0084

PROJECT NO. 2312

TASK NO. A5

MONITOR: AFOSR  
TR-89-0451

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Carcinogenesis, v9 n1 p135-  
139 1988.

ABSTRACT: (U) Intercellular communication is considered an important cellular mechanism for regulating growth and differentiation (1-4). Thus blockage of the exchange of important 'signal' ions and molecules between normal communicating cells could lead to abnormal cell proliferation. Tumor promoting agents, such as 12-O-tetradecanoylphorbol-13-acetate (TPA), have been shown to block gap junctional intercellular communication (GJIC) in various cell types. Using a scrape loading/dye transfer technique, TPA was shown to cause a dose-dependent and transient inhibition of GJIC in WB-F344, a normal rat liver epithelial cell line. Such a down-modulation of intercellular communication was found to be associated with an increase in protein kinase C (PKC) activity. Translocation of this activity to the particulate fraction occurred 10 min after exposure to 16 nM TPA and was consistent with the time course needed to inhibit GJIC. After 6 h exposure to TPA, essentially all the PKC activity was lost concurrent with the recovery of communication in these cells. During this time, the cells also became refractory to inhibition by further addition of TPA. Blockage of communication induced by TPA in WB

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cells was prevented by treating the cells with 23 micrometers palmitoyl carnitine for 1 h or 100 micrometers 8-N,N-(diethylamino)-octyl-3,4,5-trimethoxybenzoate for 30 min. The results indicate that TPA transiently modulates G1/C in WB cells and PKC activation is possibly involved in blockage of communication in these cells. Keywords: In vitro analysis. Reprints. (aw)

DESCRIPTORS: (U) \*CELLS(BIOLOGY), \*CARCINOGENS, \*DRUGS, \*LIVER, \*EPITHELIUM, ABNORMALITIES, ACTIVATION, ALKALOIDS, DYES, IN VITRO ANALYSIS, INHIBITION, IONS, MOLECULES, NEOPLASMS, RECOVERY, REPRINTS, SIGNALS, TRANSFER, TRANSIENTS, TRANSLOCATION, TOXICITY, RATS.

IDENTIFIERS: (U) WUAFOSR2312A5, PEG1102F, \*Palmitoyl carnitine, \*Methoxybenzoates, \*Gap junctional intercellular communication, Intercellular communication, Benzoate/8-n-n-(diethylamino)-octyl-3-4-5-trimethoxy, Phorbol acetates, Acetate/12-o-tetradecanoylphorbol-13, TPA(12-o-tetradecanoylphorbol-13-acetate).

MICHIGAN STATE UNIV EAST LANSING DEPT OF PEDIATRICS/HUMAN DEVELOPMENT

(U) Altered Regulation of Intercellular Communication by Epidermal Growth Factor, Transforming Growth Factor-Beta and Peptide Hormones in Normal Human Keratinocytes.

89 9P

PERSONAL AUTHORS: Trosko, James E.; Madhukar, Burra V.; Oh, Saw Y.; Chang, Chia-Cheng; Wade, M.

CONTRACT NO AFOSR-86-0084

PROJECT NO. 2312

TASK NO. A5

MONITOR: AFOSR TR-89-0448

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Carcinogenesis, v10 n1 p13-20 1989.

ABSTRACT: (U) Since many chemical tumor promoters and some oncogens have been shown to inhibit gap junction-mediated intercellular communication, the effect of various growth factors on gap junctional intercellular communication on normal human keratinocytes was examined. In order to measure the effect of the growth factors on gap junctional communication, the scrape loading/dye transfer technique was used on human keratinocytes grown in a serum-free medium in vitro. At 24 h after treatment epidermal growth factor transforming growth factor-Beta, whole bovine pituitary extract and 12-O-tetradecanoyl-phorbol-13-acetate (TPA) inhibited intercellular communication. In order to study the possible mechanism by which the growth factors might inhibit intercellular communication, the effect of the growth factors on protein kinase C activation and alterations of intracellular free calcium was investigated. The results indicated that neither protein kinase C nor an increase in (Ca2+)i were involved in the modulation of gap junctional communication by epidermal growth factor or transforming growth factor Beta. The study suggests that

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in the human keratinocytes inhibition of intercellular communication may be involved (i) in the action of growth factors such as epidermal growth factor during cellular proliferation and (ii) in the differentiation of primary keratinocytes by transforming growth factor-Beta. Reprints. (AW)

GEORGE WASHINGTON UNIV WASHINGTON DC

(U) Combustion Instability in Solid Rocket Motors.  
DESCRIPTIVE NOTE: Final rept. Oct 85-Mar 89.

MAR 89 291P

DESCRIPTORS: (U) \*EPIDERMIS, \*GROWTH SUBSTANCES, \*HORMONES, CELLS(BIOLOGY), CARCINOGENESIS, DYES, TRANSFER, PEPTIDE HYDROLASES, INHIBITION, CALCIUM, ACTIVATION, PITUITARY HORMONES.

PERSONAL AUTHORS: Price, E. W.; Flandro, G. A.

CONTRACT NO. F49620-86-C-0005

IDENTIFIERS: (U) WUAFOSR2312A5, PEG1102F, \*Keratinocytes, Intercellular communication, \*Gap junction intercellular communication, Tumor promoters, Oncogenes, Acetate/12-O-tetradecanoyl phorbol 1-13, Protein kinase C.

PROJECT NO. 2308

TASK NO. A1

MONITOR: AFOSR  
TR-89-0460

UNCLASSIFIED REPORT

ABSTRACT: (U) This report consists of a partial manuscript of a book on combustion instability, and plans for future work to complete the book. The manuscript is submitted in its present form as a report of work completed. Combustion instability, solid propellants, Rocket motors, Solid propellant rocket engines. (mjm)

DESCRIPTORS: (U) \*COMBUSTION STABILITY, \*SOLID PROPELLANT ROCKET ENGINES, BOOKS, REPORTS, ROCKET ENGINES, SOLID PROPELLANTS.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2308A1.

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GEORGIA INST OF TECH ATLANTA SCHOOL OF INFORMATION AND  
COMPUTER SCIENCE

PENNSYLVANIA STATE UNIV UNIVERSITY PARK DEPT OF  
MECHANICAL ENGINEERING

(U) Parametric Analysis of Queueing Networks with Blocking.

(U) Fuel Structure and Pressure Effects on the Formation  
of Soot Particles in Diffusion Flames.

DESCRIPTIVE NOTE: Final rept. 1 Nov 87-1 Nov 88,

DESCRIPTIVE NOTE: Annual technical rept. 15 Jan 88-15 Jan  
89,

NOV 88 10P

PERSONAL AUTHORS: Akyildiz, I. F.

FEB 89

41P

CONTRACT NO. AFOSR-88-0028

PERSONAL AUTHORS: Santoro, Robert J.

PROJECT NO. 2304

CONTRACT NO. AFOSR-87-0145

TASK NO. A2

PROJECT NO. 2308

MONITOR: AFOSR  
TR-89-0424

TASK NO. A2

MONITOR: AFOSR

TR-89-0405

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) As we already observed in the investigation of queueing networks with blocking that the throughput is a non-decreasing function of the number of jobs (3), i.e., the blocking events have the effect of violating the throughput results. Two questions arose from this observation: 1) How to distribute the total buffer capacity to the stations such that no deadlock will occur and a maximum (optional) throughput will be achieved?; and 2) Given the buffer capacity of each station in the network, how to select the total number of jobs in the network such that the throughput will be maximum (optimum)? To answer these questions first we assumed that all stations have infinite capacity and derived new formulas for optimal throughput and response times based on the well-known mean value analysis approach (4). Then in (5) we found necessary and sufficient conditions for buffer allocation in the cyclic networks with blocking such that an optimal throughput will be achieved. (kr)

DESCRIPTORS: (U) \*NETWORKS, \*QUEUEING THEORY, ALLOCATIONS, BLOCKING, BUFFERS, CAPACITY(QUANTITY), CYCLES, OPTIMIZATION, PARAMETRIC ANALYSIS, THROUGHPUT.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2304A2.

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SUPPLEMENTARY NOTE: Original contains color plates: All DTIC/NTIS reproductions will be in black and white.

ABSTRACT: (U) Studies emphasizing the effects of fuel molecular structure on soot formation processes in laminar diffusion flames have been investigated. Particular attention has been given to the particle inception and surface growth processes for a series of fuels. Studies of butane, 1-butene and 1,3 butadiene have revealed that fuel structure strongly affects the soot particle inception process. However, subsequent surface growth processes are largely determined by the available surface area. Thus, the surface growth process is independent of the fuel molecular structure following the initial particle inception stage. Studies of the particle inception region indicate that increased soot formation is strongly correlated with visible fluorescence measurements attributed to large polynuclear aromatic hydrocarbon species in the flame. Soot formation, soot particles, Diffusion Flames, Combustion. (jes)

DESCRIPTORS: (U) \*COMBUSTION, BUTANES, DIFFUSION, FLAMES, FLUORESCENCE, FUELS, GROWTH(GENERAL), LAMINAR FLOW, MEASUREMENT, MOLECULAR STRUCTURE, PARTICLES, PRESSURE.

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SOOT, SURFACES, VISIBILITY.

ILLINOIS UNIV AT URBANA

IDENTIFIERS: (U) PE61102F, WUAFOSR2308A2.

(U) Thermotropic Ionic Liquid Crystals. 6. Structural Parameters of Solid and Liquid Crystal Phases of Anhydrous Short-Chain Sodium Alkanates.

DESCRIPTIVE NOTE: Rept. for 1 Oct 85-31 Oct 86.

87 10P

PERSONAL AUTHORS: Phillips, M. L.; Jonas, J.

CONTRACT NO. AFOSR-85-0345

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-89-0250

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Liquid Crystals, v2 n3 p335-343 1987.

ABSTRACT: (U) Unit cell constants were determined from powder X ray diffraction photographs taken of several anhydrous short chain sodium alkanates at room temperature. The temperature dependence of the bilayer spacing in the alkanates was determined over the range 25-300 C. Overall changes in bilayer spacing between the solid and the neat phase were found to be much smaller than in long chain alkanates. A correspondence was noted between the room temperature lateral packing area and the 23Na quadrupole coupling constant in the mesophase. The mesophase bilayer spacing was consistent with a structural model in which the tilted anion chain rotates on a cone. X ray diffraction; Thermotropic ionic liquid crystals; Short chain; Sodium alkanates. Reprints. (mjm)

DESCRIPTORS: (U) \*LIQUID CRYSTALS, \*LIQUID PHASES, \*SOLID PHASE, \*SODIUM COMPOUNDS, \*ALKANES, \*ANIONS, CELLS, CHAINS, CONICAL BODIES, CONSTANTS, LAYERS, MODELS, PARAMETERS, PHASE, REPRINTS, ROOM TEMPERATURE, SOLIDS, STRUCTURAL PROPERTIES, THERMAL PROPERTIES, TILT, X RAY DIFFRACTION.

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AD-A206 831 20/3

IDENTIFIERS: (U) WUAFOSR2303A3, PE61102F, \*sodium  
alkanoates

TEXAS UNIV AT AUSTIN DEPT OF CHEMISTRY

(U) Development of Practical MO Techniques for Prediction  
of the Properties and Behaviour of Materials.

DESCRIPTIVE NOTE: Final technical rept. 1 Oct 85-1 Nov 88.

JAN 89 34P

PERSONAL AUTHORS: Dewar, Michael J.

CONTRACT NO. AFOSR-86-0022

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-89-0242

UNCLASSIFIED REPORT

ABSTRACT: (U) Notable advances in computational procedures include development of AM1 parameters for phosphorus and sulfur, analytical derivatives for treatments including CI, a new and effective procedure for locating transition states, AM1 parameters for boron and silicon. Work has begun on two new semiempirical treatments. There has been a revision of current ideas concerning the mechanisms of pericyclic reactions and an extensive survey of elimination reactions. A novel mechanism for superconductivity has been suggested. Phosphorus parameters, Sulfur parameters, Superconductivity, Boron, Silicon. (jes)

DESCRIPTORS: (U) \*SUPERCONDUCTIVITY, BORON, COMPUTATIONS, DERIVATIVES(MATHEMATICS), ELIMINATION REACTIONS, PARAMETERS, PHOSPHORUS, PREDICTIONS, SILICON, SULFUR, SURVEYS, TRANSITIONS.

IDENTIFIERS: (U) WUAFOSR2303B2, PE61102F.

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## DTIC REPORT BIBLIOGRAPHY

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IOWA STATE UNIV IOWA CITY

(U) Partial Support of the International Laser Science Conference (3rd) Held in Atlantic City, New Jersey on 1-4 November 1987.

DESCRIPTIVE NOTE: Final rept. 15 Jul 87-14 Jul 88.

DEC 88 3P

PERSONAL AUTHORS: Stwalley, William C

CONTRACT NO. AFOSR-87-0319

PROJECT NO. 2301

TASK NO. A1

MONITOR: AFOSR  
TR-89-0413

UNCLASSIFIED REPORT

ABSTRACT: (U) The annual International Laser Science Conferences have been established to survey the core laser science areas including lasers and their properties, spectroscopy, laser-induced processes, and a selection of laser applications. This meeting is a Topical Conference of the American Physical Society (APS) and is also the annual meeting of the APS Topical Group on Laser Science. Earlier ILS Conferences were held in Dallas in 1985 (ILS-I) and in Seattle in 1986 (ILS-II). ILS-III was held in Atlantic City, New Jersey, November 1-4, 1987, with the co-sponsorship of the Optical Society of America. (mjm)

DESCRIPTORS: (U) 'LASER APPLICATIONS, 'LASERS, 'SYMPOSIA, INTERNATIONAL, NEW JERSEY, PHYSICAL PROPERTIES, SELECTIVE, SPECTROSCOPY.

IDENTIFIERS: (U) PEB1102F, WUAFQSR2301A1.

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ILLINOIS UNIV AT URBANA DEPT OF ELECTRICAL AND COMPUTER ENGINEERING

(U) Non-Linear Optical Techniques for Thin Film Growth and Visible Ultraviolet Lasers.

DESCRIPTIVE NOTE: Final rept. 30 Sep 85-29 Sep 88.

NOV 88 49P

PERSONAL AUTHORS: Eden, J. G.

CONTRACT NO. F49620-85-C-0141

PROJECT NO. 2301

TASK NO. A1

MONITOR: AFOSR  
TR-89-0437

UNCLASSIFIED REPORT

ABSTRACT: (U) The goals of this AFOSR-supported program have been: 1) to investigate novel applications of non-linear gas phase photochemistry to the low temperature growth of semiconductor and metal films and 2) to develop new sources of stimulated emission at short wavelengths ( $\lambda < 200$  nm). This work has resulted in several significant accomplishments: 1) epitaxial semiconductor (Ge) films have been grown on GaAs at temperatures as low as 285 C by laser photochemical vapor deposition (LPVD); 2) NH<sub>3</sub> has been demonstrated as a photosensitizer in the LPVD growth of films; 3) Ge/Si alloys have been grown by LPVD and analyzed; 4) the photochemical nature of laser assisted MOCVD growth of GaAs on GaAs has been demonstrated; and 5) the excited state structure of Zn<sub>2</sub>, Cd<sub>2</sub>, Ar<sub>2</sub>, and Ne<sub>2</sub> has been examined by laser spectroscopy. Epitaxial, Semiconductor, Laser assisted, Ultraviolet germanium, Ionization, Lasers, Sensitizers, Gallium arsenides, Silicon. (mjm)

DESCRIPTORS: (U) 'EPITAXIAL GROWTH, 'GALLIUM ARSENIDES, 'GERMANIUM, 'METAL FILMS, 'SILICON, 'THIN FILMS, ALLOYS, EMISSION, FILMS, GROWTH(GENERAL), IONIZATION, LASERS, LOW TEMPERATURE, METHODOLOGY, NONLINEAR SYSTEMS, OPTICS, PHOTOCHEMICAL REACTIONS, PHOTOSENSITIVITY, SEMICONDUCTORS, SHORT WAVELENGTHS, SOURCES, SPECTROSCOPY.

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STIMULATION(GENERAL), ULTRAVIOLET LASERS, ULTRAVIOLET  
RADIATION, VAPOR DEPOSITION, VAPOR PHASES, VISIBILITY.

AIR FORCE OFFICE OF SCIENTIFIC RESEARCH BOLLING AFB DC

(U) Research Proposal Quarterly Status Report for July-  
September 1988.

IDENTIFIERS: (U) PE61102F, WUAFOSR2301A1.

OCT 88 67P

PERSONAL AUTHORS: Tyrrell, Debra

MONITOR: AFOSR  
TR-89-0390

UNCLASSIFIED REPORT

ABSTRACT: (U) This Research Proposal Status Report is published quarterly as of March, June, September, and December of each year. It lists all the research proposals received by the Air Force Office of Scientific Research (AFOSR) in the six month period prior to the date of this report. Normally, decisions and actions are made within six months after receiving a research proposal. The action taken (i.e. Initiated, Declined, or Withdrawn) will be listed in this Report. The report is divided into two parts: Part I is the Institution Index which lists the proposals received, alphabetically by institution. Part II is the AFOSR Directorate Index in which the proposals received are listed alphabetically by Directorate and alphabetically by AFOSR Program Manager within the Directorate. The purpose of the quarterly report is to uniform other Government sponsoring agencies of the proposals received by the AFOSR and the action taken on these proposals. (KR)

DESCRIPTORS: (U) \*RESEARCH MANAGEMENT, AIR FORCE  
RESEARCH.

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CARNEGIE MELLON UNIV PITTSBURGH PA DEPT OF ELECTRICAL  
AND COMPUTER ENGINEERING

BOSTON UNIV MA CENTER FOR ADAPTIVE SYSTEMS

(U) Associative Processors and Directed Graphs for Optical  
Processing.

(U) Neural Network Models of Vector Coding, Learning, and  
Trajectory Formation During Planned and Reactive Arm  
and Eye Movements.

DESCRIPTIVE NOTE: Final rept. Sep 84 Mar 89.

DESCRIPTIVE NOTE: Interim rept..

FEB 89 145P

FEB 89 37P

PERSONAL AUTHORS: Casasent, David

PERSONAL AUTHORS: Grossberg, Stephen

CONTRACT NO. AFOSR-84-0293

CONTRACT NO. F49620-86-C-0037, F49620-86-C-0018

PROJECT NO. 2305

PROJECT NO. 2313

TASK NO. 81

TASK NO. A5

MONITOR: AFOSR  
TR-89-0440

MONITOR: AFOSR  
TR-89-0430

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) This presents the final report on our recent 4 year effort. We briefly review our prior feature space and distortion-invariant processors. We then highlight several of our optical Artificial Intelligence processor concepts. Emphasis is given to new associative processor and directed graph optical systems for large knowledge base processing. Keywords: Pattern recognition, Computer generated holograms, Feature extraction. (kr)

DESCRIPTORS: (U) \*ASSOCIATIVE PROCESSING, \*IMAGE PROCESSING, \*GRAPHS, HOLOGRAMS, ARTIFICIAL INTELLIGENCE, PATTERN RECOGNITION, PROCESSING EQUIPMENT, EXTRACTION.

IDENTIFIERS: (U) PE61102F, WUAFOSR2305B1, \*Directed graphs, Knowledge base processing, Feature extraction.

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SUPPLEMENTARY NOTE: Supported in part by NSF-IRI-87-16960.

ABSTRACT: (U) Contemporary neural network models provide insights into some of the organizational principles that govern biological sensory-motor systems, and offer a level of computational precision that enables sharp comparisons and contrasts to be made between different sensory-motor systems. The capacity of these models to clarify, integrate, and predict behavioral and neural data is predicated upon the coordinated use of theoretical, mathematical, computational and empirical tools in a manner that reveals many more constraints on brain design than empirical tools alone. No single experimental paradigm in the behavioral and brain sciences provides sufficiently many data to uniquely characterize a neural system. Interdisciplinary theoretical and empirical approaches that can coordinate and discover both top down and bottom-up constraints at multiple levels of behavioral and neural organization provide a much greater level of guidance towards characterizing brain design. The present chapter takes as its point of departure one important design principle that has been clarified by such an interdisciplinary approach. This is the principle of vector encoding that has been described, for example, in both the control of

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saccadic eye movements by the superior colliculus and the control of arm movements by the motor cortex. Keywords: Neural networks; Eye movement; Arm movement; Robotics; Self-organization; Learning; Trajectory formation; Planning; Vector coding. (JHD)

DESCRIPTORS: (U) \*NEURAL NETS, \*ROBOTICS, CODING, EYE MOVEMENTS, GUIDANCE, LEARNING, MODELS, MOTORS, ORGANIZATIONS, THEORY, TRAJECTORIES, VECTOR ANALYSIS.

IDENTIFIERS: (U) PE61102F, WUAF0SR2313A5.

UNITED TECHNOLOGIES RESEARCH CENTER EAST HARTFORD CT

(U) Three Dimensional Flow and Temperature Profile Attenuation in an Axial Flow Turbine.

DESCRIPTIVE NOTE: Final rept. 15 Dec 85-15 Mar 89.

MAR 89 136P

PERSONAL AUTHORS: Joslyn, David H.; Dring, Robert P.

CONTRACT NO. F49620-86-C-0020

PROJECT NO. 2307

TASK NO. A4

MONITOR: AFOSR  
TR-89-0439

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Original contains color plates. All DTIC and NTIS reproductions will be in black and white.

ABSTRACT: (U) While strongly three dimensional and highly unsteady nature of the flow in axial turbines has, until recently, defied in-depth analysis, the benefits that can be realized from an improved capability to predict the aerodynamics and heat transfer in turbines are numerous. These benefits include improved performance through higher efficiency, higher thrust-to-weight ratio through higher turbine inlet temperature, and improved durability through more precise predictions of local heat load. This program was particularly interested in the aerodynamic mechanisms affecting attenuation of a radial temperature profile in the flow as it passed through the turbine. The radial temperature profile in the flow exiting a combustor and entering a turbine can range from compressor exit temperature (approx = 1100 F) near the hub and tip end walls to a maximum (as high as 3200 F) in the midspan region. The heat load at any location on the turbine airfoils or end walls depends strongly on the local gas temperature at that location; hence the mixing, or attenuation, of the inlet temperature profile is of critical importance. This program has advanced the state-of-the-art by providing: 1) an exhaustive aerodynamic data base for the three dimensional flow in a large scale

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axial turbine; 2) an exhaustive data base documenting the mixing of a simulated combustor exit temperature profile as it passed through the turbine; and 3) an assessment of a three dimensional time accurate, Navier-Stokes prediction of the flow in the turbine stage. Keywords: Temperature redistribution. (EDC)

DESCRIPTORS: (U) 'AXIAL FLOW TURBINES, 'THREE DIMENSIONAL FLOW, AERODYNAMICS, AIRFOILS, ATTENUATION, AXIAL FLOW, COMBUSTORS, COMPRESSORS, DATA BASES, DISTRIBUTION, EFFICIENCY, EXITS, GAS FLOW, GAS TURBINE BLADES, GASES, HEAT, HEAT TRANSFER, JET ENGINE INLETS, JET MIXING FLOW, NAVIER STOKES EQUATIONS, PRECISION, MATHEMATICAL PREDICTION, PROFILES, RATIOS, STATE OF THE ART, TEMPERATURE, THREE DIMENSIONAL, THRUST, TIME, WALLS, WEIGHT.

IDENTIFIERS: (U) End walls, PE61102F, WUAFOSR2307A4.

PENNSYLVANIA STATE UNIV UNIVERSITY PARK DEPT OF CHEMISTRY

(U) Studies on Ions and Neutrals Desorbed from Solid Surfaces by Ion and Electron Bombardment.

DESCRIPTIVE NOTE: Final rept. 1 Nov 84-31 Oct 88.

MAR 89 23P

PERSONAL AUTHORS: Winograd, Nicholas

CONTRACT NO. AFOSR-86-0028

PROJECT NO. 2303

TASK NO. A2

MONITOR: AFOSR  
TR-89-0398

UNCLASSIFIED REPORT

ABSTRACT: (U) This project was aimed toward increasing our fundamental knowledge of the details of the interaction of energetic particles with solid surfaces. These studies included the measurement of the angular and energy contributions of the yield of desorbed ions by secondary ion mass spectrometry (SIMS). In addition, we developed a novel angle and energy resolved detector capable of measuring for the first time the yield of neutral particles desorbed from monolayers. This detector utilized multi-photon resonance ionization of the ejected atoms which occur at efficiencies approaching 100%. The results of the experimental measurements were coupled to classical dynamics calculations of the ion impact event. This approach has been pursued to utilize ion beams to examine the structure of surface layers through anisotropies observed in the angular distributions. A variety of materials including alloys, semi-conductors and organic monolayers on metals were candidates as model system. The experiments have opened new avenues for using ion beam methods for the trace analysis of important electronic materials at unprecedented sensitivity limited.

DESCRIPTORS: (U) 'ELECTRON IRRADIATION, 'IONS, 'SOLID BODIES, 'SURFACES, ALLOYS, ANGLES, ANISOTROPY, ATOMS, COMPUTATIONS, DISTRIBUTION, DYNAMICS, ELECTRONIC

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EQUIPMENT, ENERGENTIC PROPERTIES, ENERGY, EXPERIMENTAL  
DATA, IMPACT, INTERACTIONS, ION BEAMS, IONIZATION, LAYERS,  
MASS SPECTROMETRY, MATERIALS, MEASUREMENT, METALS, MODELS,  
NEUTRAL, PARTICLES, PHOTONS, RESONANCE, TRACER STUDIES,  
YIELD.

HAYSTACK OBSERVATORY WESTFORD MA

(U) Multi-Instrument Studies of the Auroral Ionosphere.

DESCRIPTIVE NOTE: Final rept. 1 Nov 85-31 Oct 88.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2303A2.

MAR 89 18P

PERSONAL AUTHORS: Foster, J. C.

CONTRACT NO. AFOSR-86-0023

PROJECT NO. 2310

TASK NO. A2

MONITOR: AFOSR  
TR-89-0399

UNCLASSIFIED REPORT

ABSTRACT: (U) New data collection modes and analysis techniques were developed which provide good time and spatial coverage and empirical models of the high latitude ionosphere have been developed and tested. 1) The first three-radar azimuth scanning experiment was performed combining observations from Millstone Hill, Sondrestrom, and EISCAT to produce maps of the convection electric field at high latitudes at 30 minute intervals throughout an interval of increasing disturbance. 2) Empirical models of the ionospheric convection electric field were developed from an extensive radar data base. 3) Quantitative models have been developed describing the distribution of the field-aligned currents which link the ionosphere and magnetosphere at high-latitudes. 4) A test of the local midnight-sector differences in the ionospheric convection models based on incoherent scatter radar data and those based on satellite observations was completed. 5) A new class of intense radar backscatter from the topside F region was identified as produced by parallel current-induced enhancement of the acoustic line. 6) The general characteristics of coherent radar backscatter from E region irregularities as observed with the Millstone Hill UHF radar was the subject of an intensive study.

DESCRIPTORS: (U) \*IONOSPHERE, ALIGNMENT, ARTIFICIAL SATELLITES, AURORAE, BACKSCATTERING, COHERENT RADAR.

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CONVECTION, CURRENTS, DATA ACQUISITION, DATA BASES, E  
REGION, ELECTRIC FIELDS, F REGION, HIGH LATITUDES,  
INCOHERENT SCATTERING, INTENSITY, IONOSPHERIC MODELS,  
MODELS, OPTIMIZATION, PARALLEL ORIENTATION, RADAR RADAR  
REFLECTIONS, SPATIAL DISTRIBUTION, ULTRAHIGH FREQUENCY.

KENT STATE UNIV OHIO

(U) Description and Manipulation of Membrane Lipid  
Alterations Associated with Synaptic Functions in  
Isolated Cerebellar Glomeruli.

IDENTIFIERS: (U) PE61102F, WUAFOSR2310A2.

DESCRIPTIVE NOTE: Final rept. 1 Jan 86-31 Dec 88.

FEB 89 8P

PERSONAL AUTHORS: Dorman, Robert V.

CONTRACT NO. AFOSR-86-0045

PROJECT NO. 2312

TASK NO. A2

MONITOR: AFOSR  
TR-89-0404

UNCLASSIFIED REPORT

ABSTRACT: (U) Isolated cerebellar and hippocampal mossy  
fiber synaptosomes were used to assess the relationships  
between membrane lipid metabolism and the evoked release  
of excitatory amino acid neurotransmitters. Mossy fiber  
terminals were radio-labeled with arachidonic acid and  
the effects of membrane depolarization and calcium influx  
on the labeling of the component lipid pools were  
determined. It was observed that depolarization and Ca<sup>2+</sup>  
influx stimulated the accumulation of unesterified  
arachidonate. This effect was correlated with increased  
production of prostaglandins, and lipoxigenase inhibitors.  
The depolarization and arachidonate-induced transmitter  
release was mimicked by the addition of PGE<sub>2</sub> and blocked  
by the cyclooxygenase inhibitor ibuprofen. The  
correlation of arachidonic acid metabolism with  
prostaglandin synthesis, ATPase inhibition and Ca<sup>2+</sup>  
mobilization, suggests they may all play a role in the  
mechanisms of neurotransmitter release. (AW)

DESCRIPTORS: (U) \*CEREBELLUM, \*GLOMERULI, \*LIPID  
METABOLISM, \*MEMBRANES(BIOLOGY), \*NEUROMUSCULAR  
TRANSMISSION, \*SYNAPSE, AMINO ACIDS, CALCIUM,  
DEPOLARIZATION, FATTY ACIDS, FUNCTIONS, INHIBITION,  
ISOLATION, LIPIDS, METABOLISM, NERVE TRANSMISSION,  
PRODUCTION, PROSTAGLANDIN, RELEASE, BIOSYNTHESIS.

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HIPPOCAMPUS.

OREGON UNIV EUGENE INST OF THEORETICAL SCIENCE

IDENTIFIERS: (U) PE61102F, WUAF0SR2312A2, Mossy fibers,  
Synaptosomes, Arachidonate, Ibuprofen, Calcium channels.

(U) Ultrasmall Holographic X-Ray Gratings Using  
Synchrotron Radiation and X-Ray Lithographic  
Techniques.

DESCRIPTIVE NOTE: Final rept. 1 May 87-30 Apr 88.

NOV 88 31P

PERSONAL AUTHORS: Csonka, Paul L.; Tatchyn, Roman O.

CONTRACT NO. AFOSR-87-0211

PROJECT NO. 2301

TASK NO. A1

MONITOR: AFOSR  
TR-89-0415

UNCLASSIFIED REPORT

ABSTRACT: (U) In a series of experiments use was made of radiation generated by the undulator magnet, recently installed on ALLADIN at the Synchrotron Radiation Center. Since the properties of that radiation were not previously known, the first step consisted of characterizing the radiation not only spectrally, but also in angular intensity space. The angular characterization was accomplished by allowing the radiation to pass through a pinhole before reaching a gold photodiode. The photodiode measurements served to ascertain the beam profiles along both the horizontal and vertical directions. In terms of the first harmonic frequency,  $\nu(1)$ , the first harmonic photon energy,  $e(1)$ , can be written as  $h\nu(1)$ . At  $h\nu(1)=50$  eV, the measurements confirmed expectations and demonstrated a Gaussian distribution along both axes. Two sets of measurement were performed: one with, the other without interposition of an aluminum filter 800 Å thick. Keywords: Grating; Lithography; Undulator. (JHD)

DESCRIPTORS: (U) X RAY APPARATUS, GRATINGS(SPECTRA), LITHOGRAPHY, CYCLOTRON RESONANCE, ENERGY, HARMONICS, PHOTONS, GOLD, PHOTODIODES, SYNCHROTRONS, MEASUREMENT, NORMAL DISTRIBUTION.

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IDENTIFIERS: (U) PE61102F, WUAFOSR2301A1, 'Synchrotron radiation, Undulators, Wiggler magnets, 'X ray gratings, Aluminum filters.

JOHNS HOPKINS UNIV LAUREL MD APPLIED PHYSICS LAB

(U) Organo-Metallic Elements for Associative Information Processing

DESCRIPTIVE NOTE: Final rept. 15 Apr 85-15 Apr 88.

JAN 89 78P

PERSONAL AUTHORS: Potember, Richard S ; Poehler, Theodore O.

CONTRACT NO. AFOSR-85-0169

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-89-0388

UNCLASSIFIED REPORT

ABSTRACT: (U) In the three years of the program we have:  
(1) built and tested a 4 bit element matrix device for possible use in high density content-addressable memories systems; (2) established a test and evaluation laboratory to examine optical materials for nonlinear effects, saturable absorption, harmonic generation and photochromism; (3) successfully designed, constructed and operated a codeposition processing system that enables organic materials to be deposited on a variety of substrates to produce optical grade coatings and films. This system is also compatible with other traditional microelectronic techniques; (4) used the sol-gel process with colloidal AgTCNQ to fabricate high speed photochromic switches; (5) develop and applied for patent coverage to make V02 optical switching materials via the sol-gel processing using vanadium (IV) alkoxide compounds. Nonlinear optics, conducting polymers, electrical switches, Charge-transfer complexes, organic solids, neural networks, Organic semiconductor, Photochromics, TCNQ V02. (jes)

DESCRIPTORS: (U) 'ASSOCIATIVE PROCESSING, 'INFORMATION PROCESSING, 'MICROELECTRONICS, 'ORGANOMETALLIC COMPOUNDS, 'PHOTOCHROMIC MATERIALS, ABSORPTION, CHARGE TRANSFER, DEPOSITION, ELECTRIC SWITCHES, HARMONIC GENERATORS.

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NEURAL NETS, NONLINEAR SYSTEMS, OPTICAL COATINGS, OPTICAL MATERIALS, OPTICS, ORGANIC MATERIALS, PATENTS, PHOTOCHROMISM, POLYMERS, PROCESSING, SATURATION, SEMICONDUCTORS, SOLIDS, SUBSTRATES, SWITCHES, VANADIUM.

CLAREMONT GRADUATE SCHOOL CA DEPT OF MATHEMATICS

(U) Three-Dimensional Modelling for Contact Resistance of Current Flow into a Source/Drain Region.

IDENTIFIERS: (U) PE61102F, WJAFOSR2303A3.

DESCRIPTIVE NOTE: Final rept. 1 Jun 87-31 May 88.

MAY 88 35P

PERSONAL AUTHORS: Cumberbatch, Ellis; Fang, Weifu

CONTRACT NO. AFOSR-87-0222

PROJECT NO. 2304

TASK NO. A9

MONITOR: AFOSR  
TR-89-0433

UNCLASSIFIED REPORT

ABSTRACT: (U) Various extensions of the transmission line model are introduced to find the resistance for current flow in MOSFET source/drain regions. The geometry is taken to be a rectangular box with a rectangular contact on the upper surface. Explicit formulae are derived by assuming that the current flow is restricted to various geometrical planes. Comparison of basic results with simulation and experimental data is good. Comparison with simulation results for misalignment is less good. (mjm)

DESCRIPTORS: (U) \*DRAINAGE, \*MODELS, \*MOSFET, \*SEMICONDUCTORS, \*SIMULATION, \*TRANSMISSION LINES, BOXES, COMPARISON, EXPERIMENTAL DATA, FLOW, MISALIGNMENT, RECTANGULAR BODIES, REGIONS, SOURCES, SURFACES.

IDENTIFIERS: (U) PE61102F, WJAFOSR2304A9.

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AEROCHEM RESEARCH LABS INC PRINCETON NJ

CHEMICAL REACTIONS, COEFFICIENTS, COMPUTER APPLICATIONS, COMPUTER PROGRAMS, COMPUTERIZED SIMULATION, ELECTRONS, FLOW RATE, LINEARITY, MOLECULES, NEUTRAL, RATES, REACTION TIME, RESPONSE, THERMODYNAMICS, ACETYLENE, OXYGEN, ARGON, DIFFUSION, RECOMBINATION REACTIONS.

(U) Computer Modeling of Soot Formation Comparing Free Radical and Ionic Mechanisms.

DESCRIPTIVE NOTE: Annual rept. 1 Oct 87-30 Sep 88.

MAR 89 41P

IDENTIFIERS: (U) PE61102F, WJAFDSR2308A2, Ion molecule interactions, Ion electron interactions.

PERSONAL AUTHORS: Calcote, H. F.; Gill, Robert J.

REPORT NO. AEROCHEM-TP-482

CONTRACT NO. F49620-88-C-0007

PROJECT NO. 2308

TASK NO. A2

MONITOR: AFOSR  
TR 89-0417

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Prepared in cooperation with Pennsylvania State Univ., University Park.

ABSTRACT: (U) A collaborative effort has been initiated between AeroChem and Penn State to compare the relative importance of the free radical mechanism of Frenklach and associates and the ionic mechanism of Calcote and associates by use of a computer program run at Penn State. During the present report period, the thermodynamic data for some neutral species and the ions employed in the ionic mechanism were either compiled from the literature or calculated; the reaction mechanism was developed and the rate coefficients either obtained from the literature or estimated; and the ambipolar diffusion coefficients of the ions involved were calculated. Considerably more work is yet required in estimating the reaction rate coefficients. Comparative computer runs will first be made on the well documented sooting acetylene/oxygen/argon flat flame at a pressure of 1.67 kPa and a linear flow rate of 50 cm/s. Keywords: Soot formation; Ionic mechanism; Thermodynamics; Ion-Molecule reactions; Ion electron recombination; Ionic diffusion. (AW)

DESCRIPTORS: (U) \*FREE RADICALS, \*IONS, \*SOOT, \*FLAMES.

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WESTINGHOUSE RESEARCH AND DEVELOPMENT CENTER PITTSBURGH  
PA

(U) Superconducting Oxide Films for Multispectral Infrared  
Sensors.

DESCRIPTIVE NOTE: Final rept. 1 Jan-31 Dec 88.

FEB 89 43P

IDENTIFIERS: (U) PE61102F, WUAFOSR081281.

PERSONAL AUTHORS: Braginski, A. I.; Forrester, M. G.

REPORT NO. 89-9S52-INFSC-R1

CONTRACT NO. F49620-88-C-0030

PROJECT NO. D812

TASK NO. B1

MONITOR: AFOSR  
TR-0385

UNCLASSIFIED REPORT

ABSTRACT: (U) We have investigated optical detection in epitaxial and granular films of  $\text{YBa}_2\text{Cu}_3\text{O}_{7-\Delta}$  at wavelengths of 0.63, 3.39, and 10.6 micrometers, at temperatures from 4.2K to 100K. Epitaxial films, and granular films fabricated at Westinghouse, exhibit an optically-induced voltage shift,  $\Delta V$ , which is proportional to the temperature derivative of the sample dc resistance at the same bias current. Granular films provided by the University of Texas, which exhibit 'semiconducting' resistive behavior, exhibit a response which deviates from  $dR/dT$ , but which can be explained in terms of the temperature dependence of the film thermal conductance. The response time of all films is long and strongly wavelength dependent, varying from of order microseconds at 0.63 micrometers to tenths of a second at 3.39 micrometers. Our results indicate that all these films exhibit only bolometric or thermal detection, with no evidence for quantum or non-equilibrium effects in this temperature range. Superconductivity. High temperature. Infrared, Optical, Yttrium barium copper oxide, Thin films, Detection, Epitaxial, Granular (jes)

DESCRIPTORS: (U) \*SUPERCONDUCTIVITY, \*THERMAL

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PRINCETON UNIV NJ

NORTHWESTERN UNIV EVANSTON IL DEPT OF CIVIL ENGINEERING

(U) Lumped Model Generation and Evaluation: Sensitivity and Lie Algebraic Techniques with Applications to Combustion.

(U) Dynamic Response of Embedded Structures.

DESCRIPTIVE NOTE: Final rept. 15 Jan 86-14 Jan 89.

DESCRIPTIVE NOTE: Final technical rept.

JAN 89 26P

MAR 89 10P

PERSONAL AUTHORS: Keer, Leon M.; Shah, Surendra P.

PERSONAL AUTHORS: Rabitz, H.; Dryer, F. L.; Yetter, R.

CONTRACT NO. AFOSR-86-0058

CONTRACT NO. AFOSR-85-0346

PROJECT NO. 2302

PROJECT NO. 2308

TASK NO. C1

TASK NO. A2

MONITOR: AFOSR

MONITOR: AFOSR  
TR-89-0418

TR-89-0421

UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) This program dealt with the development and application of new approaches for producing and evaluating semi-empirical (lumped parameter) models of physical processes. Procedures using local sensitivity gradient methods were used to study the existing lumped kinetic models for the moist carbon monoxide oxidation to show that transport processes can cause oversimplified lumped models derived from homogeneous kinetics to fail when applied to flame propagation systems. New models are under development which will include the appropriate level of detail. A Lie group formalism was developed to address global parameter space mapping issues for first order differential equations. The rigorous criteria for the existence of exact lumping by linear projective transformations was also established. (kr)

DESCRIPTORS: (U) 'CARBON MONOXIDE, 'COMBUSTION, 'REACTION KINETICS, ALGEBRA, DIFFERENTIAL EQUATIONS, FLAME PROPAGATION, GRADIENTS, HOMOGENEITY, LIE GROUPS, MATHEMATICAL MODELS, MOISTURE, OXIDATION, PARAMETERS, SENSITIVITY, TRANSPORT PROPERTIES.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2308A7.

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ABSTRACT: (U) A shock impulse environment simulated by low velocity impact (free-drop impact system) was developed to generate a well characterized dynamic loading on the free surface. Low velocity impact of a circular plate resting on sand provided the vehicle by which the dynamic loading on the free surface was characterized. An analysis based on linear elastodynamics was derived for transient waves on a thin plate resting on an elastic half-space (sand). The results provide an understanding of plate vibration (foundation vibration), of the interaction between the plate and the sand, and of the propagation of the load into the sand. The dynamic behavior of a typical elastic buried structure was studied by using plexiglass; where as micro reinforced-concrete was used to study the behavior of a buried reinforced concrete structure. Loading relief at the center of the roof of the buried structures was observed. Furthermore, the stiffer structure was observed to the experience loss soil arching. When a linear-elastic dynamic analysis by the finite element method was conducted, the numerical results were found to have good correlation with the experimental observation of the peak displacement with the buried roof. However, the behavior after the peak response can not be simulated using the current linear elastic formulation. (AW)

DESCRIPTORS: (U) 'DYNAMIC LOADS, 'DYNAMIC RESPONSE,

AD A206 682

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\*ELASTIC PROPERTIES, \*PLATES, \*REINFORCED CONCRETE,  
\*UNDERGROUND STRUCTURES, ARCHES, BURIED OBJECTS,  
DISPLACEMENT, ELASTIC WAVES, EMBEDDING, ENVIRONMENTS,  
FINITE ELEMENT ANALYSIS, FORMULATIONS, FREE DROPPING,  
IMPACT, LINEARITY, LOSSES, LOW VELOCITY, MECHANICAL  
PROPERTIES, NUMERICAL ANALYSIS, OBSERVATION, PEAK VALUES,  
PROPAGATION, IMPULSE LOADING, ROOFS, SAND,  
SHOCK(MECHANICS), SOILS, TRANSIENTS, VIBRATION, WAVES,  
IMPACT TESTS.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2302C1.

MASSACHUSETTS INST OF TECH CAMBRIDGE

(U) A Dilogarithmic Extension of Liouville's Theorem on  
Integration in Finite Terms.

DESCRIPTIVE NOTE: Final rept. 1 Mar 87-28 Feb 88,

FEB 88 39P

PERSONAL AUTHORS: Moses, Joel; Baddoura, Jamil

CONTRACT NO. AFOSR-87-0167

PROJECT NO. 2304

TASK NO. A7

MONITOR: AFOSR  
TR-89-0432

UNCLASSIFIED REPORT

ABSTRACT: (U) The result obtained generalizes  
Liouville's Theorem by allowing, in addition to the  
elementary functions, dilogarithms to appear in the  
integral of an elementary function. The basic conclusion  
is that an associated function to the dilogarithm, if  
dilogarithms appear in the integral, appears linearly,  
with logarithms appearing in a non-linear way. (kr)

DESCRIPTORS: (U) \*LIOUVILLE EQUATION, \*THEOREMS,  
FUNCTIONAL ANALYSIS, NONLINEAR SYSTEMS.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2304A7, Liouville  
theorem.

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AAI CORP COCKEYSVILLE MD

(U) Femtosecond Real-Time Probing of Reactions. 3.  
Inversion to the Potential from Femtosecond Transition-  
State Spectroscopy Experiments.

JAN 89 15P

PERSONAL AUTHORS: Bernstein, Richard B.; Zewail, Ahmed H.

CONTRACT NO. AFOSR-87-0071

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-89-0420

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Chemical Physics, v90  
n2 p829-842, 15 Jan 89. See also Volume 1, AD-A204 983.

ABSTRACT: (U) Fem-to-second transition state spectroscopy (FTS) of elementary reactions (M. Dantus, M. J. Rosker, and A.H. Zewail, J. Chem. Phys. 87, 2395 (1987)) provides real-time observations of photofragments in the process of formation. A classical mechanical description of the time-dependent absorption of fragments during photodissociation (R. Bersohn and A. H. Zewail, Ber. Bunsenges. Phys. Chem. 92, 373 (1988)) forms the basis for the present scheme for relating observations to the potential energy surface. A direct inversion scheme is presented that allows the difference in two relevant excited-state potential curves to be deduced from observed transients at different probe wavelength tunings. In addition, from the shape and dependence of the transients on pump wavelength, information on the lower of the two potential curves (i.e., that of the dissociating molecule) is obtained. The methodology is applied to the experimental FTS data (Dantus et al) on the CN photofragment from the ICN photodissociation. Fem-to-second transition state spectroscopy. Real time observations. Time dependent absorption fragments. Photodissociation Reprints. (mjim)

DESCRIPTORS: (U) \*FRAGMENTS, \*PHOTODISSOCIATION.

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\*SPECTROSCOPY, \*TRANSITIONS, ABSORPTION, FREQUENCY, INVERSION, MECHANICAL PROPERTIES, POTENTIAL ENERGY, PROBES, PUMPS, REAL TIME, REPRINTS, SURFACES, TIME DEPENDENCE, TRANSIENTS.

IDENTIFIERS: (U) PE61102F, WJAFDSR2303B1.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI32L

AD-A206 676 CONTINUED

UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES DEPT OF CHEMISTRY

COLLISIONS, CYANIDES, DISSOCIATION, DYNAMICS, GASES, HIGH ENERGY, IMPACT, KINETIC ENERGY, MOLECULES, NITROSO COMPOUNDS, SCATTERING, SURFACES.

(U) State to State Collision Induced Dissociation and Gas/ Surface Interactions.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B1.

DESCRIPTIVE NOTE: Final rept. Oct 85-Oct 88.

MAR 89 19P

PERSONAL AUTHORS: Wittig, Curt; Reisler, Hanna

CONTRACT NO. F49620-86-C-0004

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-89-0383

UNCLASSIFIED REPORT

ABSTRACT: (U) The main thrust of our contract was directed towards the study of gas surface interactions and the complementary collisionless photodissociation processes. Our initial experiments were concerned with NO scattering from an insulating MgO(100) single crystal surfaces, and the preliminary results have been published in Chem. Phys. Lett. We are now conducting experiments in which molecules with high kinetic energy are dissociated and/or ionized upon impact on surfaces. Our preliminary results, which are first of their kind since they involve state-resolved detection of the dissociation products, have been accepted as a Communication in the Journal of Chemical Physics. In parallel with these new experiments, we have continued our studies of the photophysics and photodissociation dynamics of molecules which are suitable candidates for the beam/surface and beam/beam experiments. These include detailed studies of the photodissociation dynamics of such molecules as nitrosyl cyanide, nitrosyl chloride, t-BuNO and n- and iso-nitrosopropane. Gas surface collisions. Scattering. Nitrogen oxide. Photodissociation dynamics. Dissociative scattering. (mjm)

DESCRIPTORS: (U) \*GAS SURFACE INTERACTIONS, \*NITROGEN OXIDES, \*PHOTODISSOCIATION, \*MAGNESIUM OXIDES, CHLORIDES.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI32L

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AD-A206 669 CONTINUED

MASSACHUSETTS INST OF TECH CAMBRIDGE DEPT OF MECHANICAL ENGINEERING

(U) Basic Instability Mechanisms in Chemically Reacting Subsonic and Supersonic Flows.

DESCRIPTIVE NOTE: Final scientific rept. 30 Sep 83-31 Dec 88.

FEB 89 21P

PERSONAL AUTHORS: Toong, Tau-Yi

CONTRACT NO. AFOSR-83-0373

PROJECT NO. 2308

TASK NO. A2

MONITOR: AFOSR  
TR-89-0414

UNCLASSIFIED REPORT

ABSTRACT: (U) This report summarizes the main results and conclusions of research on turbulent combustion. The main objective was to determine and elucidate the mechanisms governing turbulence-combustion interactions in different spectral regimes. Problems studied included:

- 1) Structure of disturbed flames; 2) Evolution of turbulence-combustion interactions; and 3) Thermal and flow structures of turbulent premixed V-flames at low Damkoehler numbers. In an experimental investigation, simultaneous measurements of velocity and temperature in premixed, rod-stabilized, lean methane-air V-flames demonstrated the presence of high-frequency fluctuations within slowly drifting flame brushes, leading to temporal changes in flame shapes, thicknesses and propagation speeds. Cross-correlation coefficients of these simultaneous signals assumed high values within the reaction zone, suggesting the possibility that these fluctuations might be induced by the same governing mechanism. A theoretical study showed the importance of 'wrinkling-like' effects as well as the effects of chemical reactions rate on the evolution of fluctuations in a reacting shear layer. The direct rate augmentation effects due to reaction led to changes in phase relationships between the various fluctuations, resulting

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in turbulent energy and mass transport in a direction opposite to that suggested by the gradient model.  
Keywords: Reaction kinetics; Energy transport; Thermal and flow structures; Methane/ethane/air; High frequency fluctuations; Spectral density distributions; Probability density functions. (edc)

DESCRIPTORS: (U) \*FLAME PROPAGATION, \*COMBUSTION STABILITY, \*SUBSONIC FLOW, \*SUPERSONIC FLOW, \*TURBULENCE, AIR, BRUSHES, BURNING RATE, CHEMICAL REACTIONS, COEFFICIENTS, COMBUSTION, CROSS CORRELATION, DRIFT, ENERGY, ENERGY TRANSFER, ETHANES, FLAMES, GRADIENTS, HIGH FREQUENCY, INTERACTIONS, LAYERS, MASS TRANSFER, MEASUREMENT, METHANE, MATHEMATICAL MODELS, PHASE, PROBABILITY DENSITY FUNCTIONS, RATES, REACTION KINETICS, SHAPE, SHEAR PROPERTIES, SIGNALS, SPECTRA, SPECTRAL ENERGY DISTRIBUTION, SYNCHRONISM, THERMAL PROPERTIES, THICKNESS, VARIATIONS, VELOCITY.

IDENTIFIERS: (U) Instability, Damkoehler number, PEG1102F, WUAFOSR2308A2.



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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI32L

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MINNESOTA UNIV MINNEAPOLIS INST FOR MATHEMATICS AND ITS APPLICATIONS

CHEMICAL DYNAMICS CORP UPPER MARLBORO MD

(U) Signal Processing.

(U) Calculation of Kinetic Data for Processes Leading to UV Signatures.

DESCRIPTIVE NOTE: Final rept. 1 Jul-13 Dec 88.

DESCRIPTIVE NOTE: Final rept. 1 Aug 88-31 Jan 89.

FEB 89 39P

MAR 89 56P

PERSONAL AUTHORS: Miller, Willard, Jr

PERSONAL AUTHORS: Swaminathan, P. K.; Natanson, G. A.; Garrett, B. C.; Redmon, M. J.

CONTRACT NO. AFOSR-88-0283

CONTRACT NO. F49620-88-C-0085

PROJECT NO. 2304

PROJECT NO. 3605

TASK NO. A6

TASK NO. A1

MONITOR: AFOSR  
TR-89-0412

MONITOR: AFOSR

TR-89-0395

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) Partial Contents: On the complexity of pattern recognition algorithms on a tree-structured parallel computer; Soliton mathematics in signal processing; The phase problem of X-Ray crystallography; Extension problems under the displacement structure regime; Basic Algorithms in Tomography; Speech recognition using pattern recognition methods. Keywords: Abstracts. (kr)

ABSTRACT: (U) Novel state-of-the-art computational techniques were developed and validated for studying collisional processes responsible for producing infrared and ultraviolet signatures in rocket plumes. The promising new methods involve computation of cross sections and rates within a semiclassical methodology. Two of the key beneficiary programs are the SPURC and the CHARM programs which require detailed microscopic dynamical information (kinetic rates and cross sections) about such collisional processes for successful modeling of the chemistry within appropriate flowfield simulation codes. Successful prediction and interpretation of ultraviolet signatures require treating collision induced transitions between different electronic states caused by the coupling between electronic and nuclear motions in molecules during collisions. Electronic transitions bring in inherently quantum mechanical effects that have no analog in classical mechanics. The task of numerically solving the quantum mechanical equations of motion is still an unsolvable computational problem for many realistic molecular systems. The semiclassical theory is accurate enough to reproduce specific quantum mechanical features necessary, because it leads to ordinary differential equations instead of the partial differential equations of quantum mechanics. Electronic

DESCRIPTORS: (U) \*SIGNAL PROCESSING, \*SPEECH RECOGNITION, ALGORITHMS, CRYSTALLOGRAPHY, DISPLACEMENT, METHODOLOGY, PATTERN RECOGNITION, TOMOGRAPHY, X RAYS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A6.

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structure information required in modelling the production of candidate excited species, nitrogen, nitric oxide, and hydroxyl radical molecules in some elementary reactions was analyzed. It was determined that modern quantum chemistry can provide all the required information involving excited hydroxyl production and less extensive data for other systems. (lhd)

ILLINOIS UNIV AT URBANA COORDINATED SCIENCE LAB

(U) Stochastic Systems with Multiple Decision Makers and Parametric Uncertainties.

DESCRIPTIVE NOTE: Final rept. 1 May 85-30 Apr 88.

JUN 88 27P

DESCRIPTORS: (U) \*EXHAUST PLUMES, \*INFRARED SIGNATURES, \*HYDROXYL RADICALS, \*EMISSION SPECTRA, \*ROCKET EXHAUST, \*ULTRAVIOLET SIGNATURES, CODING, PARTICLE COLLISIONS, COMPUTATIONS, CROSS SECTIONS, DIFFERENTIAL EQUATIONS, DYNAMICS, ELECTRON TRANSITIONS, ELECTRONIC STATES, ELECTRONICS, FLOW FIELDS, KINETICS, MICROSCOPY, MOLECULAR STRUCTURE, MOLECULES, NITROGEN, NITROGEN OXIDES, PARTIAL DIFFERENTIAL EQUATIONS, PRODUCTION, QUANTUM CHEMISTRY, QUANTUM THEORY, REACTION KINETICS, SIMULATION, STATE OF THE ART, TRANSITIONS.

PERSONAL AUTHORS: Basar, Tamer

CONTRACT NO. AFOSR-84-0056

PROJECT NO. 2304

TASK NO. A8

MONITOR: AFOSR

TR-89-0423

IDENTIFIERS: (U) PE65502F, WUAFOSR3005A1.

UNCLASSIFIED REPORT

ABSTRACT: (U) This final report summarizes the findings of research on the topic Stochastic Dynamic Systems with Multiple Decision Makers and Parametric Uncertainties, supported by a Grant from the Air Force Office of Scientific Research, during the period May 1, 1985-April 30, 1988. The focus of the research during this three-year period has been on the development of methodologies and new solution techniques for obtaining strategies in stochastic systems, with good sensitivity properties, and for deriving optimal decision rules in systems with nonclassical information patterns. A further major thrust has been on the development of learning schemes and distributed algorithms for multiple decision-maker problems under different types of uncertainty. (kr)

DESCRIPTORS: (U) \*DECISION MAKING, \*STOCHASTIC PROCESSES, ALGORITHMS, DISTRIBUTION, DYNAMICS, LEARNING, METHODOLOGY, OPTIMIZATION, PATTERNS, SENSITIVITY, SOLUTIONS(GENERAL).

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A8.

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ILLINOIS UNIV AT URBANA DEPT OF CHEMISTRY

NORTH DAKOTA STATE UNIV FARGO DEPT OF CHEMISTRY

(U) Nuclear Magnetic Resonance and Laser Scattering Techniques at High Pressure,

(U) Convenient Routes to Di-tert-butylsilanediyl: Chemical, Thermal and Photochemical Generation,

87 44P

OCT 88 3P

PERSONAL AUTHORS: Jonas, Jiri

PERSONAL AUTHORS: Boudjouk, Philip; Samaraweera, Upasiri; Sooriyakumaran, Ratnasabapathy; Chrusciel, Jerzy; Anderson, Kevin R.

CONTRACT NO. AFOSR-85-0345

PROJECT NO. 2303

CONTRACT NO. AFOSR-88-0060

TASK NO. A3

PROJECT NO. 2303

MONITOR: AFOSR TR-89-0251

TASK NO. B2  
MONITOR: AFOSR TR-89-0369

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in High Pressure Chemistry and Biochemistry, p193-235 1987.

ABSTRACT: (U) This review covers various aspects of nuclear magnetic resonance spectroscopy and laser Raman and Rayleigh spectroscopy at high pressure. The presentation is organized into the following main sections: 1. Introduction; 2. Experimental High Pressure NMR Techniques; 3. Experimental High Pressure Laser Scattering Techniques; 4. Applications of NMR at High Pressure; 5. Applications of Laser Raman Scattering at High Pressure. The main emphasis is on studies aimed towards improving our fundamental understanding of the dynamic structure of fluids but several examples dealing with disordered solids are also included. High pressure; Raman scattering fluids; Disordered solids; Nuclear magnetic resonance; Reprints. (mjm)

DESCRIPTORS: (U) \*LASERS, \*LIGHT SCATTERING, \*NUCLEAR MAGNETIC RESONANCE, \*NUCLEAR RADIATION SPECTROSCOPY, \*RAMAN SPECTROSCOPY, DYNAMICS, FLUIDS, HIGH PRESSURE, ORDER DISORDER TRANSFORMATIONS, RAMAN SPECTRA, REPRINTS, SOLIDS

IDENTIFIERS: (U) PEG1102F, WUAFOSR2303, A3.

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SUPPLEMENTARY NOTE: Pub. in Angewandte Chemie, International Edition in English, v27 n10 p1355-1356 Oct 88.

ABSTRACT: (U) Although the chemistry of the silanediyl is well developed and of continuing interest, there are few convenient methods for generating these species on a preparative scale. We had need for a variety of methods for making di-tert-butylsilanediyl (2) and in this communication we report three convenient routes for generating this intermediate, possibly in a complexed form like 8, in high yields. Silane, Butyl radicals, Reprints. (mjm)

DESCRIPTORS: (U) \*BUTYL RADICALS, \*SILANES, CHEMISTRY, PHOTOCHEMICAL REACTIONS, REPRINTS, YIELD.

IDENTIFIERS: (U) WUAFOSR230382, PEG1102F, \*silanediyl/di-tert-butyl.

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WYMAN-GORDON CO WORCESTER MASS

(U) Study of the Influence of Metallurgical Factors on Fatigue and Fracture of Aerospace Structural Materials.

CRACK PROPAGATION, CRACKS, CYCLES, DISPERSIONS, FORCE(MECHANICS), FRAGMENTS, GROWTH(GENERAL), INTENSITY, IRON ALLOYS, METALLURGY, MICROSTRUCTURE, NICKEL ALLOYS, OXIDES, RATES, STATE OF THE ART, STRESSES, STRUCTURAL PROPERTIES, SUPERALLOYS, TOUGHNESS, TRANSFER FUNCTIONS, VARIABLES.

DESCRIPTIVE NOTE: Final rept. 1 Jan 86-31 Dec 88.

MAR 89 35P

IDENTIFIERS: (U) PE61102F, WUAFOSR2306A1, LPN-SWRI-06-8972, LPN-SWRI-8972/5, Crack tips.

PERSONAL AUTHORS: Lankford, James; Davidson, David L.; Chan, Kwai S.; Leverant, Gerald R.

CONTRACT NO. F49620-86-C-0024

PROJECT NO. 2306

TASK NO. A1

MONITOR: AFOSR  
TR-89-0400

UNCLASSIFIED REPORT

ABSTRACT: (U) Direct SEM measurement of closure local to crack tips in several structural alloys was performed. Growth rates for both large and small cracks in an aluminum alloy, a nickel-base superalloy, and an intermetallic alloy were correlated by formulating correctly the crack driving force. It was determined that apparent differences in crack growth rates under varying circumstances, including variable amplitude loading, were caused not by differences in the intrinsic crack advance mechanism but rather by inaccuracies in determining the proper transfer function between the conventional cyclic stress intensity, and the true local crack driving force. The relationship between microstructure and fracture toughness was investigated for state-of-the-art Al-Fe-X alloys. Relevant fracture mechanisms and origins of fracture toughness were identified, and analyzed in terms of microstructural factors (dispersoids and oxide fragments). The origin of the brittle-to-ductile transition in Al-Fe-X was identified, and shown to be controlled by the tearing modulus. Concepts for increasing toughness were established. Aircraft. (JES)

DESCRIPTORS: (U) 'AEROSPACE CRAFT, 'ALLOYS, 'CONSTRUCTION MATERIALS, 'FRACTURE(MECHANICS), 'FATIGUE(MECHANICS), AIRCRAFT, ALUMINUM ALLOYS, AMPLITUDE.

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MASSACHUSETTS INST OF TECH CAMBRIDGE DEPT OF CHEMISTRY

MASSACHUSETTS INST OF TECH CAMBRIDGE DEPT OF CHEMISTRY

(U) Reactions of Laser-Generated CF<sub>2</sub> (Free Radicals) on Silicon and Silicon Oxide Surfaces.

(U) Energy and Chemical Change.

DESCRIPTIVE NOTE: Scientific interim rept.,

DESCRIPTIVE NOTE: Final rept. 1 Nov 86-1 Nov 88.

89

11P

NOV 88

30P

PERSONAL AUTHORS: Langan, J. G.; Shorter, J. A.; Xin, Xu; Joyce, S. A.; Steinfield, J. I.

PERSONAL AUTHORS: Levine, R. D.; Kinsey, J. L.

CONTRACT NO. F49620-86-C-0003, NSF-CHE86-02986

CONTRACT NO. AFOSR-86-0011

PROJECT NO. 2303

PROJECT NO. 2303

TASK NO. B1

TASK NO. B3

MONITOR: AFOSR  
TR-89-0367MONITOR: AFOSR  
TR-89-0434

UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Surface Science, v207 p344-353 1989.

ABSTRACT: (U) The algebraic approach to the structure and dynamics of molecules has been applied in a number of ways: The ability to compute the spectra of energy-rich molecules has been demonstrated. Broad gateway states have been examined for vibrationally excited molecules. A link between the intramolecular dynamics and the statistical analysis of spectra has been established. The underlying potential energy has been determined directly from the observed spectra. The intramolecular dynamics of vibrationally excited acetylene has been studied and the spectral signatures of vibrational energy pathways have been examined. Keywords: Energy rich molecules; Spectrum; Intensity distribution; Reaction pathways. (JES)

DESCRIPTORS: (U) DISSOCIATION, FLUORINATED HYDROCARBONS, OXIDES, PHOTOLYSIS, SILICON, SILICON COMPOUNDS, SINGLE CRYSTALS, CHEMISORPTION, FREE RADICALS, PRECURSORS, REPRINTS, SURFACES, ULTRAVIOLET LASERS, VAPOR PHASES

DESCRIPTORS: (U) ELECTROMAGNETIC SPECTRA, MOLECULE MOLECULE INTERACTIONS, CHEMICAL REACTIONS, ACETYLENE.

IDENTIFIERS: (U) PES1102F, WUAFOSR2303B1, Carbon difluoride.

IDENTIFIERS: (U) PES1102F, WUAFOSR2303B3.

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VANDERBILT UNIV NASHVILLE TN DEPT OF CHEMISTRY

(U) Ab Initio Studies of Molecular Structures and Energies  
2 Energies and Stabilities of PH(n), SH(n), and ClH(n)  
Compounds.

CHLORINE, COMPUTATIONS, DECOMPOSITION, ENERGY, MOLECULAR  
STRUCTURE, MOLECULES, PH FACTOR, REPRINTS, RESOLUTION,  
STRUCTURAL PROPERTIES, THERMODYNAMICS.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2303B3.

89

PERSONAL AUTHORS: Ewig, Carl S.; Van Wazer, John R.

CONTRACT NO. AFOSR-86-0146

PROJECT NO. 2303

TASK NO. B3

MONITOR: AFOSR  
TR-89-0441

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of the American Chemical  
Society, v111 n5 p1552 1558 1989 See also Volume 1, AD-  
A174 601.

ABSTRACT: (U) The energies and molecular structures of  
the highly coordinated species PH5, SH4, SH6, ClH3, and  
ClH5 have been derived by ab initio computations. Of  
particular interest are ClH3, which is of C2v symmetry,  
and ClH5, which is C4v. MP2 vibrational frequencies were  
derived for each species. Each was found to be  
structurally stable, although ClH7 was found to be  
unstable. The enthalpies and free energies for the  
decomposition of each species with respect to loss of H  
and H2 were computed. Each was found to be  
thermodynamically unstable with respect to these  
processes except loss of H atoms by PH5, SH6, and SH4.  
The thermodynamic instability was greatest for the  
chlorine hydrides. The energy of each compound was  
analyzed by use of the ab initio multicenter energy  
resolution, a method of analysis that was found to be an  
especially powerful way of elucidating the nature of its  
bonding and the origins and degree of its structural  
stabilities. Molecular stability, Hydrogen compounds,  
Hypervalent, Quantum chemistry, Reprints. (mjn)

DESCRIPTORS: (U) \*ENERGETIC PROPERTIES, \*HYDRIDES,  
\*HYDROGEN COMPOUNDS, \*QUANTUM CHEMISTRY, \*STABILITY.

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VANDERBILT UNIV NASHVILLE IN DEPT OF CHEMISTRY

REPRINTS, SPINNING(MOTION), VARIABLES, WATER, WAVE  
FUNCTIONS.

(U) Perturbative Corrections to Basis Incompleteness in  
Molecular SCF Calculations.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B3.

89 14P

PERSONAL AUTHORS: Ewig, Carl S.; Smentek-Mielczarek,  
Lidia; Hess, B A., Jr

CONTRACT NO. AFOSR-86-0146

PROJECT NO. 2303

TASK NO. 83

MONITOR: AFOSR  
TR-89-0409

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Theoretica Chimica Acta, v75  
p129-141 1989.

ABSTRACT: (U) A unified summary is presented of the  
mathematical approach developed by McDowell for employing  
perturbation theory to correct for basis-set  
incompleteness in ab initio SCF calculations. Revised  
expressions for the corrections to the wavefunction both  
in terms of orbitals and spin orbitals are presented with  
explicit incorporation of the spin variables. Employing  
H2O as an example, we show that this approach is  
considerably more powerful for computing molecular  
energies with standard basis sets than was indicated by  
previous work. In particular at the higher levels of  
approximation it accurately reproduces the effect of  
polarization functions in sets such as 6-31G\* and 6-31G+.  
The equilibrium molecular structure of H2O was also  
computed by this approach and found to give good accuracy  
In each case perturbing functions coupled to both  
occupied and virtual orbitals are required for acceptable  
results. Perturbation theory, Green's functions, Basis  
sets, Quantum mechanics, Water. Reprints (mjfm)

DESCRIPTORS: (U) ACCURACY, CORRECTIONS, ENERGY,  
EQUILIBRIUM(GENERAL), FUNCTIONS, GREENS FUNCTION,  
MATHEMATICS, MOLECULAR STRUCTURE, MOLECULES, PERTURBATION  
THEORY, PERTURBATIONS, POLARIZATION, QUANTUM THEORY.

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SRI INTERNATIONAL MENLO PARK CA

MOLECULAR WEIGHT, MONOMERS, PHASE TRANSFORMATIONS,  
POLYMERIZATION, RATES, REACTION TIME, REPRINTS, RODS,  
SHEAR PROPERTIES, TEMPERATURE.

(U) Reaction Kinetics and Chemo-Rheology of Poly(p-  
phenylenebisthiazole) Polymerization in the  
Ordered Phase.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2303B3, Chemorheology,  
Phenylenebisthiazole.

JUL 88 10P

PERSONAL AUTHORS: Chow, Andrea W.; Sandell, Janet F.;  
Wolfe, James F.

REPORT NO. SRI-PYU-4621

CONTRACT NO. F49620-85-K-0015

PROJECT NO. 2303

TASK NO. B3

MONITOR: AFOSR  
TR-89-0396

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Polymer, v29 p1307-1312 1988.

ABSTRACT: (U) The phenomenon of mesophase-enhanced  
polymerization of the rodlike polymer  
poly(phenylenebisthiazole) at 15% by weight in  
polyphosphoric acid has been investigated. The reacting  
mixture becomes anisotropic at an early stage of the  
polymerization. The reaction rate increases significantly  
at the isotropic-nematic phase transition as the rods are  
aligned in positions more favourable for the condensation  
reaction to occur. The chemo-rheological properties at  
high shear rates but not at low shear rates, also  
indicate the occurrence of the phase change. A systematic  
study of the effects of shear rate and temperature  
suggests that initial mixing of the monomer mixture below  
the polymerization temperature greatly influences the  
final achievable molecular weight of the polycondensation  
reaction. Keywords: Polymers, Fibers heat treatment,  
Polymerization, Phosphoric acids, Rod polymers,  
Polyphosphoric acids, Reprints. (sdw)

DESCRIPTORS: (U) PHOSPHORIC ACIDS, POLYMERS, REACTION  
KINETICS, RHEOLOGY, ACIDS, CONDENSATION REACTIONS,  
FIBERS, HEAT TREATMENT, HIGH RATE, LOW RATE, MIXTURES.

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NOTRE DAME UNIV IN

IDENTIFIERS: (U) PE61102F, WUAFOSR2306B1, Group III-V  
semiconductors.

(U) Vibrational, Mechanical, and Thermal Properties of III-V Semiconductors.

DESCRIPTIVE NOTE: Final technical rept. 1 Sep 85-31 Aug 88.

FEB 89 8P

PERSONAL AUTHORS: Dow, John D.

CONTRACT NO. AFOSR-85-0331

PROJECT NO. 2306

TASK NO. B1

MONITOR: AFOSR  
TR-89-0387

UNCLASSIFIED REPORT

ABSTRACT: (U) Theories of the mechanical, vibrational, and electronic properties of III-V semiconductors have been developed and applied to (i) help determine the feasibility of InN-based visible and ultraviolet lasers and light detectors, (ii) develop a theory of phonons in semiconductor alloys, (iii) understand surface reconstruction of semiconductors, (iv) predict the effects of atomic correlations on the light-scattering (Raman) properties of semiconductive alloys, (v) develop a new first principles pseudo-function implementation of local-density theory, (vi) study the oxidation of GaAs, (vii) develop a theory of scanning tunneling microscope images, and (viii) understand the electronic and optical properties of highly strained artificial semiconductors and small semiconductor particles. (JHD)

DESCRIPTORS: (U) \*SEMICONDUCTOR DEVICES, \*OPTICAL DETECTORS, \*SEMICONDUCTOR LASERS, \*ULTRAVIOLET DETECTORS, ATOMIC PROPERTIES, CORRELATION TECHNIQUES, ELECTRONICS, GALLIUM ARSENIDES, GROUP III COMPOUNDS, GROUP V COMPOUNDS, OPTICAL IMAGES, ELECTRONICS, MICROSCOPES, OPTICAL PROPERTIES, OXIDATION, PARTICLE SIZE, PHONONS, SCANNING, SEMICONDUCTORS, THEORY, THERMAL PROPERTIES, TUNNELING(ELECTRONICS), ULTRAVIOLET LASERS.

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MASSACHUSETTS INST OF TECH CAMBRIDGE DEPT OF CHEMISTRY

CALIFORNIA INST OF TECH PASADENA GRADUATE AERONAUTICAL  
LABS(U) Organosilicon Compounds and Polymers and Silicon  
Ceramics.

(U) Unsteady and Separated Flows.

DESCRIPTIVE NOTE: Final scientific rept. 1 Oct 85-31 Oct  
88.DESCRIPTIVE NOTE: Annual technical rept. 1 Oct 87-30 Sep  
88.

MAR 89

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NOV 88

PERSONAL AUTHORS: Seyferth, Dietmar

PERSONAL AUTHORS: Dimotakis, P. E.; Leonard, A.; Roshko,  
A.

CONTRACT NO. AFOSR-85-0265

CONTRACT NO. F49620-86-C-0134

PROJECT NO. 2303

PROJECT NO. 3484

TASK NO. B2

TASK NO. A1

MONITOR: AFOSR

TR-89-0389

MONITOR: AFOSR

TR-89-0386

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) The n-BuLi/Me3COK reagent metalates every fourth CH<sub>2</sub> group of (CH<sub>3</sub>)<sub>2</sub>SiCH<sub>2</sub>. The metalated polymer was converted to vinyl-containing polycarbosilanes whose reaction with (CH<sub>3</sub>SiH)(CH<sub>3</sub>Si)H gave useful preceramic polymers. Cross-linkable CH<sub>3</sub>(H)SiCH<sub>2</sub>N has been prepared using CH<sub>3</sub>(Ph)SiCH<sub>2</sub>N as starting material. The reactions of (CH<sub>3</sub>SiH)(CH<sub>3</sub>Si)H with Cp<sub>2</sub>Me<sub>2</sub> (M= Ti, Sr Hf) gave precursors for SiC/MC blends. 1,1,3,3-Tetramethyl-1,3-disilacyclobutane can be metalated with t-BuLi/TMEDA. Keywords: Metal carbonyls, 1,1,3,3-Tetramethyl-1,3-disilacyclobutane, Biscyclopentadienyldimethyl derivatives, Polycarbosilanes, Polysilanes, Silicon carbide. (aw)

DESCRIPTORS: (U) CERAMIC MATERIALS, ORGANIC COMPOUNDS, POLYSILANES, SILICON COMPOUNDS, METAL CARBONYLS, POLYMERS, SILICON, SILICON CARBIDES, STARTING.

IDENTIFIERS: (U) PE61102F, WJAFOSR230382, Polycarbosilanes, Cyclobutanes.

ABSTRACT: (U) A computer controlled system for the X-carriage on the Tow Tank has been installed. A force balance for measuring dynamic forces on models carried by the carriage has been built and installed. Initial measurements of such forces have been obtained on a flat plate airfoil at various angles of attack. Optical and computer components have been assembled and integrated into a system for acquiring and processing streakline images of fluorescent particles in flow fields in water. Water-tunnel experiments on a Liebeck airfoil showed that a large cavity on the upper surface (to establish a free shear layer along the pressure plateau) promotes reattachment into the adverse pressure gradient and delays stall. Unsteady flow; Separated flow; Vortex interaction; Flow control. (mjim)

DESCRIPTORS: (U) COMPUTERS, CONTROL SYSTEMS, FLOW FIELDS, FLOW SEPARATION, UNSTEADY FLOW, ADVERSE CONDITIONS, AIRFOILS, ANGLE OF ATTACK, BALANCE, CAVITIES, CONTROL, DYNAMIC LOADS, FLOW, FLUORESCENCE, IMAGES, INTERACTIONS, LAYERS, MEASUREMENT, MODEL BASINS, OPTICAL EQUIPMENT, PARTICLES, PLATES, PRESSURE GRADIENTS, SHEAR PROPERTIES, SURFACES, VORTICES, WATER.

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IDENTIFIERS: (U) PES1102F, WUAFOSR3484A1.

BRISTOL UNIV (ENGLAND) DEPT OF INORGANIC CHEMISTRY

(U) Chemistry of Polynuclear Metal Complexes with Bridging Carbene or Carbyne Ligands. Part 83. Molybdenum and Tungsten Complexes Containing the Alkylidyne Group C(eta6-C6H4(OMe-2)Cr(CO)3).

88

PERSONAL AUTHORS: Fernandez, Jose R.; Stone, F. G.

CONTRACT NO. AFOSR-86-0125

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-89-0344

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of the Chemical Society, Dalton Trans., p3035-3040, 1988.

ABSTRACT: (U) In our early work on polynuclear metal compounds with bridging alkylidyne ligands we employed as a precursor the compound W(C6HMe-4)(CO)2(eta-C5H5). In this paper we introduce a further class of mononuclear metal alkylidyne complex for use in the preparation of compounds having metal metal bonds. In the new reagents, the molybdenum or tungsten atoms are ligated by the alkylidyne group C6H4OMe-2, the arene ring of which is eta-co-ordinated to a Cr(CO)3 moiety. The resulting products thus contain an additional metal-ligand fragment. Reprints. (mjm)

DESCRIPTORS: (U) \*METAL COMPLEXES, \*METAL COMPOUNDS, \*MOLYBDENUM, \*TUNGSTEN, ATOMS, BRIDGES, CARBENES, CHEMICAL AGENTS, CHEMISTRY, LIGANDS, METAL METAL BONDS, PREPARATION REPRINTS.

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CALIFORNIA UNIV SAN DIEGO LA JOLLA DEPT OF CHEMISTRY

VIRGINIA UNIV CHARLOTTESVILLE DEPT OF APPLIED  
MATHEMATICS AND COMPUTER SCIENC E

(U) Reactions of (eta 5-C5H5)(eta 5-C5Me5r)(Si(SiMe3)3)X (X = Cl, Me) Complexes with Carbon Monoxide and the Isocyanide 2,6-Me2C6H3NC. Crystal Structure of (eta 5-C5H5)-(eta 5-C5Me5r)(eta 2-C(N-2,6-Me2C6H3)Si(SiMe3)3)Cl.

(U) Increasing the Margin of Stability of Arbitrarily Finite Modes of Flexible Large Space Structures with Damping.

88

DESCRIPTIVE NOTE: Annual rept. 1 Sep 87-31 Aug 88,

DEC 88

PERSONAL AUTHORS: Elsner, Frederick H.; Tilley, T. D.; Rheingold, Arnold L.; Geib, Steven J.

PERSONAL AUTHORS: Lasiecka, I.; Triggiani, R.

CONTRACT NO. AFOSR-85-0228

REPORT NO. UVA/525683/AM89/102

PROJECT NO. 2303

CONTRACT NO. AFOSR-87-0321

TASK NO. B2

MONITOR: AFOSR

TR-89-0328

MONITOR: AFOSR

TR-89-0346

UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) Early transition metal silyl compounds are proving to have a rich reaction chemistry that is distinct from that of late transition metal silyl derivatives. For example, early transition metal (do) silyl complexes are reactive toward insertions of unsaturated substrates into their M-Si bonds, whereas late metal silyls typically are not. We are interested in the factors that influence this insertion chemistry, and have observed that the reactivity of early metal-silicon bonds varies considerably as the metal, and substituents at both the metal and silicon, are changed. Here we describe some insertion chemistry that has been observed for the mixed-ring zirconium silyls. Reprints. (mjim)

DESCRIPTORS: (U) \*BONDING, \*CARBON MONOXIDE, \*METALS, \*SILICON, CHEMICAL REACTIONS, CRYSTAL STRUCTURE, REACTIVITIES, REPRINTS, TRANSITION METALS.

IDENTIFIERS: (U) PE61102F, WUAFOSR230382.

ABSTRACT: (U) Achievements during this report period include new results for wave equations and plate equations, linear and nonlinear, on the following problems: exact controllability, strong and uniform stabilization, structural damping, quadratic optimal control problem, Riccati equations, and numerical aspects thereof. Keywords: Space based flexible structures, Equations of motion.

DESCRIPTORS: (U) \*DAMPING, \*CONTROL SYSTEMS, \*FLEXIBLE STRUCTURES, \*SPACECRAFT, CONTROL, EQUATIONS OF MOTION, OPTIMIZATION, QUADRATIC EQUATIONS, RICCATI EQUATION, SPACE BASED, STABILITY, STABILIZATION, STRUCTURAL PROPERTIES, WAVE EQUATIONS.

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AD-A206 470 20/4

CALIFORNIA UNIV BERKELEY LAWRENCE BERKELEY LAB

MASSACHUSETTS UNIV AMHERST DEPT OF MATHEMATICS AND STATISTICS

(U) Low Energy X-Ray and Electron Physics and Technology for High-Temperature Plasma Diagnostics.

(U) Vortex Dynamics and Vortex Breakdown.

DESCRIPTIVE NOTE: Final scientific rept. 1 Oct 86-30 Sep 87.

DESCRIPTIVE NOTE: Annual rept. 1 Mar 87-28 Feb 88.

OCT 87

AUG 88

PERSONAL AUTHORS: Henke, Burton L.

PERSONAL AUTHORS: Berger, Melvyn S.

CONTRACT NO. AFOSR-ISSA-87-0019

CONTRACT NO. AFOSR-87-0170

PROJECT NO. 2301

PROJECT NO. 2304

TASK NO. A1

TASK NO. A9

MONITOR: AFOSR

MONITOR: AFOSR  
TR-89-0351

TR-89-0195

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) This program in low-energy x-ray physics and technology has expanded into a major program with the principal objective of supporting research and application programs at the new large x-ray source facilities, particularly the high temperature plasma and synchrotron radiation sources. This program addresses the development of absolute x-ray diagnostics for the fusion energy and x-ray laser research and development. The new laboratory includes five specially designed spectrographic stations for the measurement of x-rays and the associated photoemissions in the 100-10,000 eV region. Keywords: X-ray diagnostics; X-ray lasers. Fusion energy. (jhd)

ABSTRACT: (U) Topics studied include: 1) I have been able to determine analytically vortex rings and bubbles with swirl via the Stokes stream-function from an isoperimetric variational viewpoint extending my previous work. and 2) In the case of thin vortex rings I have been able to establish analytically the Hamiltonian formulation and the calculus of variations. (edc)

DESCRIPTORS: (U) \*VORTICES, BUBBLES, CALCULUS OF VARIATIONS, DYNAMICS, FORMULAS(MATHEMATICS), HAMILTONIAN FUNCTIONS, RINGS, THINNESS.

IDENTIFIERS: (U) Vortex rings. Vortex breakdown. WUAFOSR2304A9, PE61102F.

DESCRIPTORS: (U) \*X RAY APPARATUS, \*CONTROLLED NUCLEAR FUSION, \*X RAY DIAGNOSTICS, ELECTRONS, HIGH TEMPERATURE, LASERS, LOW ENERGY, MEASUREMENT, PLASMA DIAGNOSTICS, PLASMAS(PHYSICS), RADIATION, SPECTROGRAPHS, STATIONS, SYNCHROTRONS, X RAYS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2301A1, X ray lasers.

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COLORADO UNIV AT DENVER

(U) Fast Algorithms for Partial Differential Equations on Advanced Computers.

DESCRIPTIVE NOTE: Final rpt. 1 Feb 86-1 May 88.

MAR 89

PERSONAL AUTHORS: Manteuffel, Thomas A.

CONTRACT NO. AFOSR-86-0061

PROJECT NO. 2304

TASK NO. A3

MONITOR: AFOSR  
TR-89-0352

UNCLASSIFIED REPORT

ABSTRACT: (U) This report covers four areas of research. The first area is an analysis of preconditionings. We have examined the properties that a preconditioning must possess in order to yield an iterative method with convergence properties independent of the discretization parameters. The second area is an attempt to provide a framework for the construction of conjugate gradient methods. The third area of research is the analysis of the equations governing the transport of neutrally charged particles and the construction of iterative methods for the solution of discrete transport equations. The final area of research is supraconvergence which deals with accurately approximating the solution of partial differential equations on highly irregular meshes. The first topic is very theoretical in nature but will have important implications to the practical choice of preconditionings. The second area is also theoretical in nature, but leads immediately to the development of new iterative methods. The third area builds on the analysis of the continuous operators to yield insight into the behavior of discrete approximations. The final goal of this third project is the development of efficient numerical methods for the solution of discrete transport equations on massively parallel machines. The final area of research will lead to more efficient solution of differential equations on irregular meshes. (KR)

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DESCRIPTORS: (U) \*ALGORITHMS, \*PARTIAL DIFFERENTIAL EQUATIONS, APPROXIMATION(MATHEMATICS), BEHAVIOR, CHARGED PARTICLES, COMPUTERS, CONSTRUCTION, CONVERGENCE, DIFFERENTIAL EQUATIONS, DISCRETE DISTRIBUTION, EFFICIENCY, EQUATIONS, GRADIENTS, ITERATIONS, METHODOLOGY, NUMERICAL METHODS AND PROCEDURES, PARALLEL PROCESSORS, SOLUTIONS(GENERAL), TRANSPORT PROPERTIES, YIELD.

IDENTIFIERS: (U) WUAFOSR2304A3, PES1102F.

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DTIC REPORT BIBLIOGRAPHY

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ARIZONA UNIV TUCSON OPTICAL SCIENCES CENTER

CALIFORNIA UNIV IRVINE DEPT OF MECHANICAL ENGINEERING

(U) Laboratory for X-Ray Optics.

(U) Fundamental Studies on Spray Combustion and Turbulent Combustion.

DESCRIPTIVE NOTE: Final rept. 1 Sep 86-31 Aug 88.

DESCRIPTIVE NOTE: Annual technical rept. 1 Nov 87-31 Oct 88.

OCT 88

PERSONAL AUTHORS: Falco, C. M.

FEB 89

CONTRACT NO. AFOSR-86-0317

PERSONAL AUTHORS: Sirignano, W. A.; Samuelsen, G. S.; Rangel, R. H.; Chiang, C.-H.; Miralles-Wilhelm, F.

PROJECT NO. 3396

\* CONTRACT NO. AFOSR-86-0016

TASK NO. A6

PROJECT NO. 2308

MONITOR: AFOSR

TR-89-0293

TASK NO. A2

UNCLASSIFIED REPORT

MONITOR: AFOSR

TR-89-0436

ABSTRACT: (U) A silicon/metals molecular beam epitaxy (MBE) apparatus was purchased with this support. The capability for producing MBE multilayer coatings for use in the 10-A to 300-A wavelength range (i.e., between soft x rays and the extended ultraviolet, referred to here as x-UV) is unique at laboratories conducting research in the field of x-ray optics. The University of Arizona now has a complete program, with capabilities for design, fabrication, characterization, and testing of multilayer coatings for the XUV; for development of state-of-the-art instrumentation to produce and characterize these materials; and for training graduate students and visiting scientists in this important field. (UHD)

DESCRIPTORS: (U) \*EPIAXIAL GROWTH, \*X RAY APPARATUS, COATINGS, INSTRUMENTATION, LAYERS, OPTICS, SILICON, SOFT X RAYS, STATE OF THE ART, FAR ULTRAVIOLET RADIATION, X RAYS, MOLECULAR BEAMS.

IDENTIFIERS: (U) WUAFOSR3396A6, PE61102F.

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ABSTRACT: (U) Four major research tasks were performed during the year. Several prototype liquid atomization experimental designs were developed and tested, and the pulse visualization system was demonstrated. A nonlinear theory for liquid sheet deformation has been developed that predicts vortical rollup of the liquid-gas interface and allows for a rough estimate of early ligament dimensions in the atomization process. The turbulent reactive flow study identifies that the mixing and entrainment rates are identical on the high-speed and low-speed sides of a constant-density mixing layer. The formation, merging, and pairing of vortical structures is also predicted. Variable property effects have been included in the vaporizing droplet theory providing significant modifications on drag coefficients, Nusselt number, and Sherwood numbers. Modified correlations for higher transfer numbers are being developed and interacting droplets are considered. Keywords: Spray combustion, Turbulent combustion, Atomization.

DESCRIPTORS: (U) \*ATOMIZATION, \*COMBUSTION, \*TURBULENT FLOW, \*VORTICES, COEFFICIENTS, DEFORMATION, DRAG, DROPS, ENTRAINMENT, ESTIMATES, FLOW, GASES, INTERACTIONS, INTERFACES, LIGAMENTS, LIQUIDS, LOW VELOCITY,

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MODIFICATION, NONLINEAR SYSTEMS, PROTOTYPES, RATES,  
REACTION KINETICS, ROUGHNESS, SHEETS, SIDES, SPRAYS,  
THEORY, TRANSFER, TURBULENCE, VARIABLES.

BRISTOL UNIV (ENGLAND) DEPT OF INORGANIC CHEMISTRY

(U) Chemistry of Polynuclear metal complexes with Bridging  
Carbene or Carbyne Ligands. Part 84. Carborane  
Tungsten Platinum Complexes having a  $\text{Mu-CC}_6\text{H}_3\text{Me}(2)-2,6$   
Ligand: Crystal Structures of  $(\text{Wpt}(\text{Mu-CC}_6\text{H}_3\text{Me}(2)-2,6)$   
 $(\text{CO})\text{N}-(\text{Pet}3)(\text{Mu-Alp};\text{ha};\text{ETA5-C2B}_9\text{HMe}_2)(\text{N}=2\text{ or }3)$ .

IDENTIFIERS: (U) PE61102F, WUAFOSR2308A2.

89

MONITOR: AFOSR-TR-89-0347  
24804.7-MS

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in ANTEC, p1626-1629 1988.

ABSTRACT: (U) The reaction between the salts in acetone  
at low temperature affords the dimetal compound in which  
the carborane ligand forms a B-H $\mu$ pt three center bond  
by employing a BH group in the pentagonal face of the cage.  
This product readily affords the complex  $(\text{Wpt}(\text{Mu-CC}_6\text{H}_3\text{Me}_2\text{O}_2-6)(\text{CO})_2(\text{Pet}3)-(\text{Mu-N5-C2B}_9\text{H}_8\text{Me}_2))$  as a mixture  
of two isomers. The structure of the major isomer has  
been established by the X Ray diffraction.

DESCRIPTORS: (U) \*CARBENES, \*LIGANDS, \*METAL COMPLEXES,  
ACETONES, LOW TEMPERATURE, ISOMERS, MIXTURES, REPRINTS,  
BONDED JOINTS, TUNGSTEN, BORON, CRYSTAL STRUCTURE,  
HYDROGEN, LOSSES, X RAY DIFFRACTION.

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COLUMBIA UNIV NEW YORK DEPT OF CHEMISTRY

NORTH DAKOTA STATE UNIV FARGO DEPT OF CHEMISTRY

(U) Femtosecond Studies of Electron-Cation Geminate Recombination in Water.

89

PERSONAL AUTHORS: Lu, Hong; Long, Frederick H.; Bowman, Robert M.; Eisenthal, Kenneth B.

CONTRACT NO. AFOSR-88-0014

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-89-0356

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Physical Chemistry, v93 n1 p27-28 1989.

ABSTRACT: (U) Femtosecond photoionization studies in neat water at room temperature have been performed. After the electron has solvated, we have seen for the first time geminate recombination of the electron cation pair formed upon ionization. The recombination kinetics appears to level off after roughly 60ps with 50-60% of the electrons having undergone geminate recombination. Reprints. (mjm)

DESCRIPTORS: (U) \*PHOTOIONIZATION, \*RECOMBINATION REACTIONS, \*WATER, CATIONS, ELECTRONS, IONIZATION, REACTION KINETICS, REPRINTS, ROOM TEMPERATURE, TEMPERATURE.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B2.

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PERSONAL AUTHORS: Rajkumar, Amirthini B.; Boudjouk, Philip

CONTRACT NO. AFOSR-88-0060

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-89-0373

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Organometallics, v8 p549-550 1989.

ABSTRACT: (U) While there is an abundance of catalysts that are useful in promoting the addition of the Si-H bond across alkenes and alkynes, relatively few agents efficiently catalyze the hydrosilylation of acrylonitrile. In particular, catalysts that lead to exclusively Beta-addition to the double bond in acrylonitrile are rare and generally give low yields. These include tertiary amines, platinum on carbon, Raney nickel, amides, and phosphines. The two most effective catalysts are a three-component system (CuCl/n-Bu<sub>3</sub>N/N,N,N',N'-tetramethylethylenediamine (TMEDA) developed by Bluestein which requires temperatures of 50-126 C for 40 h to give 75% yields of Beta-adduct (7.5:1:1.2 mol ratio of reactants/CuCl/amines) and a binary system of a copper compound (Cu<sub>2</sub>O, CuCl, or Cu(acac)<sub>2</sub>) and an isocyanide developed by Svoboda et al., which requires heating to 120 C for 2 h to give 70-75% yields of Beta-adduct (9:0.1:0.3 mol ratio of reactants/Cu catalysts/isocyanide). Reprints. (jes)

DESCRIPTORS: (U) \*ACRYLONITRILE POLYMERS, \*BONDING, \*CATALYSTS, \*REACTIONS(CHEMISTRY), ALKENES, ALKYNES, AMIDES, AMINES, CARBON, COPPER COMPOUNDS, PHOSPHINE, PLATINUM, RATIOS, REPRINTS, YIELD.

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IDENTIFIERS: (U) PEG1102F, WUAFOSR2303B2.

BOSTON UNIV MA CENTER FOR ADAPTIVE SYSTEMS

(U) Sustained Oscillations in a Symmetric Cooperative-Competitive Neural Network: Disproof of a Conjecture about Content Addressable Memory.

88

PERSONAL AUTHORS: Cohen, Michael A.

CONTRACT NO. F49620-86-C-0037

MONITOR: AFOSR  
TR-89-0341

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Neural Networks, v1 p217-221 1988.

ABSTRACT: (U) Cohen and Grossberg proved that a large class of neural networks with symmetric interaction coefficients admit a global Liapunov function guaranteeing that their trajectories approach equilibrium points. Such networks function as content-addressable memories, and the equilibria are the stored memories. Cohen and Grossberg also conjectured, based upon substantial computational evidence, that networks within a class of mixed cooperative-competitive networks with symmetric interaction coefficients also have this property. This conjecture is here disproved. In particular, a class of homogeneous, distance dependent, on-center off-surround neural networks are constructed which supports persistent oscillations for appropriate initial data. Such a class is constructed in each even dimension. Similary systems, which have been used to model the dynamics of the hippocampus, are compared to this class of networks to clarify the origins of oscillatory class of behavior in this class of systems. Reprints. (JHD)

DESCRIPTORS: (U) \*MEMORY DEVICES, \*NEURAL NETS, COEFFICIENTS, COMPUTATIONS, DYNAMICS, FUNCTIONS, HIPPOCAMPUS, INTERACTIONS, NETWORKS, OSCILLATION, REPRINTS, SIZES(DIMENSIONS), SYMMETRY, LYAPUNOV FUNCTIONS, ADDRESSING.

IDENTIFIERS: (U) PEG1102F, Addressable memories.

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## DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI32L

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PENNSYLVANIA UNIV PHILADELPHIA DEPT OF PHYSICS

HUGHES RESEARCH LABS MALIBU CA

(U) Molecular Optics Nonlinear Optical Processes in Organic and Polymeric Crystals and Films.

(U) Cooperative Phenomena for New Coherent Radiation Sources.

DESCRIPTIVE NOTE: Final rept. Jun 85-Apr 88.

DESCRIPTIVE NOTE: Final rept. 14 May 87-14 Jun 88.

APR 88

OCT 88

PERSONAL AUTHORS: Garito, A. G.

PERSONAL AUTHORS: McFarlane, R. A.

CONTRACT NO. F49620-85-C-0105

CONTRACT NO. F49620-85-C-0058

PROJECT NO. 2303

PROJECT NO. 2301

TASK NO. A3

TASK NO. A1

MONITOR: AFOSR  
TR-89-0360MONITOR: AFOSR  
TR-89-0321

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) Experimental and theoretical studies have firmly established that the largest second and third order microscopic nonlinear optical susceptibilities occur in organic and polymer systems. This major development has resulted in studies in optical bistability, phase conjugate wave generation, and neural networks. The physical microscopic origin and mechanism of second and third order nonlinear optical responses in conjugate polymers has been investigated. New theoretical concepts relating to the many-body nature of highly charge-correlated pi-electron states have been developed. The nonlinear optical responses of new pi-electron topological structures have been calculated. Optical bistability in nonlinear optical conjugated polymers has been demonstrated. (mjm)

DESCRIPTORS: (U) \*CRYSTALS, \*NONLINEAR SYSTEMS, \*OPTICAL MATERIALS, \*OPTICAL PROPERTIES, \*ORGANIC MATERIALS, \*POLYMERS, EXPERIMENTAL DATA, NEURAL NETS, RESPONSE, THEORY, WAVE PROPAGATION.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2303A3.

ABSTRACT: (U) The principal objective of this research is to investigate, both theoretically and experimentally, cooperative optical transitions in solids, with the goal of finding efficient systems for the generation of upconverted stimulated emission. Of interest also are new optical pair effects and studies of the resonance fluorescence and coherence on cooperative transitions. In the third year of the program, significant advances were made in the experimental aspects. Measurements of upconversion dynamics were made in erbium-doped crystals and in a fluorozirconate glass. Upconversion laser operation was observed at two visible wavelengths in YLiF<sub>4</sub>:Er 5% and pumping pathways identified. Spectral and lifetime studies are reported for promising new laser host materials. Upconversion lasers; Cooperative phenomena; Pair processes; Rare earth ions; Solid state lasers; Coherent sources; Yttrium; Lithium fluorides; Erbium. (mjm)

DESCRIPTORS: (U) \*COHERENT RADIATION, \*ERBIUM, \*LASER MATERIALS, \*LITHIUM FLUORIDES, \*OPTICAL PROPERTIES, \*RARE EARTH ELEMENTS, \*SOLID STATE LASERS, COHERENCE, CONVERSION, DYNAMICS, EFFICIENCY, EMISSION, FLUORESCENCE, FREQUENCY, IONS, LASERS, OPERATION, RESONANCE, SOLIDS, SOURCES, SPECTRA, STIMULATION(GENERAL), TRANSITIONS, VISIBILITY.

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PITTSBURGH UNIV PA SURFACE SCIENCE CENTER

IDENTIFIERS: (U) PE61102F, WUAFOSR2301A1

(U) Observation of Adsorbate Vibrational Amplitude Modification during a Phase Transformation in the Overlayer.

DEC 88

PERSONAL AUTHORS: Kiskinova, Maya; Szabo, Andras; Yates, John T., Jr

CONTRACT NO. AFOSR-82-0133

PROJECT NO. 2303

TASK NO. A2

MONITOR: AFOSR  
TR-89-0314

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Physical Review Letters, v61  
n25 p2875-2878, 19 Dec 88.

ABSTRACT: (U) The digital electron stimulated desorption ion angular distribution method has been used to observe the amplitude of the low frequency frustrated-translational modes of chemisorbed CO on Pt(111) when the CO adsorbs on empty Pt sites present in a p (2x2)-Se overlayer. Significant changes in the CO vibrational amplitudes are observed during a two-dimensional phase transition driven by repulsive forces in the overlayer. This work represents the first observation of the relationship between the vibrational amplitude of an adsorbed molecule and a phase transformation in an overlayer. Keywords: Surface phase transformation, Adsorbate, Frustrated translation, Selenium, Carbon monoxide, Platinum, Reprints. (M/JM)

DESCRIPTORS: (U) \*ADSORPTION, \*CARBON MONOXIDE, \*PHASE TRANSFORMATIONS, \*PLATINUM, \*SELENIUM, AMPLITUDE, MOLECULES, OBSERVATION, REPRINTS, SURFACES, TWO DIMENSIONAL, VIBRATION.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303A2, platinum(111).

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WYOMING UNIV LARAMIE DEPT OF PHYSICS AND ASTRONOMY

(U) Ground-Based Infrared Observations of Sources  
Discovered by the AFGL FIRSE and IRAS Infrared  
Surveys.

IDENTIFIERS: (U) PE61102F, WUAFOSR2311A1, \*Infrared  
astronomy, Infrared sources(Astronomy).

DESCRIPTIVE NOTE: Final rept. 15 Jul 84-14 Jul 87.

JUN 88 4P

PERSONAL AUTHORS: Spillar, E J.

CONTRACT NO. AFOSR-85-0058

PROJECT NO. 2311

TASK NO. A1

MONITOR: AFOSR  
TR-89-0345

UNCLASSIFIED REPORT

ABSTRACT: (U) The contracts research objective was to understand the infrared sources discovered by the AFGL, FIRSE and IRAS Infrared Surveys. Work has continued on young stellar objects with a variety of collaborators. In particular, extensive infrared and radio observations have yielded new information on the true nature of this highly energetic outflow object. Particular results are the lack of a disk and the resolution of accelerated shells. High resolution maps have been made of several other young stellar objects in an effort to understand the energetics and nature of the objects. The group has continued its investigation of comets. Comets investigated include Giacobini-Zinner and Halley. Emphasis has been on understanding the emission from the dust in these objects. Because of the changing illumination of these dust grains, and the well understood geometry of comets, these objects provide unique information on interstellar dust. (UJD)

DESCRIPTORS: (U) \*INFRARED RADIATION, \*ASTRONOMY, COMETS, COSMIC DUST, ENERGETIC PROPERTIES, GEOMETRY, HIGH RESOLUTION, ILLUMINATION, INTERSTELLAR SPACE, MAPS, OBSERVATION, RESOLUTION, SOURCES, ACCELERATION, STARS, SURVEYS.

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FLOW INDUSTRIES INC KENT WA

(U) Unsteady Flows Around Three-Dimensional Lifting Surfaces.

IDENTIFIERS: (U) Supermaneuverability, PE61102F, WUAFOSR2307A1.

DESCRIPTIVE NOTE: Final technical rept. 1 May 83-30 Sep 85.

NOV 85

PERSONAL AUTHORS: Gad-el-Ha1, Mohamed

REPORT NO. FLOW-RR-342

CONTRACT NO. F49620-85-C-0028

PROJECT NO. 2307

TASK NO. A1

MONITOR: AFOSR  
TR-89-0305

UNCLASSIFIED REPORT

ABSTRACT: (U) The time-dependent flows around wings and slender bodies of revolution undergoing large amplitude harmonic motions were investigated using unique flow visualization techniques. The lifting surfaces were towed in an 18-meter water channel at Reynolds numbers up to 750,000. The effects of planform, leading edge contour, reduced frequency and Reynolds number were investigated. The unsteady separation phenomenon was found to be significantly different from the separation on a lifting surface in steady flight. The role of the separation vortices was elaborated and a model of the flow field is proposed. Keywords: Pitch motion, Delta wings, Maneuverability, Unsteady separated flows, Lifting surfaces, Three-dimensional wings, Body of revolution, Supermaneuverability. (EDC)

DESCRIPTORS: (U) DELTA WINGS, FLOW SEPARATION, LIFTING SURFACES, UNSTEADY FLOW, AMPLITUDE, BODIES OF REVOLUTION, CONTOURS, FLIGHT, FLOW FIELDS, FLOW VISUALIZATION, HARMONICS, LEADING EDGES, MANEUVERABILITY, MOTION, PITCH MOTION, PLANFORM, REYNOLDS NUMBER, SLENDER BODIES, STEADY STATE, THREE DIMENSIONAL, TIME DEPENDENCE, TOWED BODIES, VORTICES, CHANNELS (WATERWAYS).

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NORTH DAKOTA STATE UNIV FARGO DEPT OF CHEMISTRY

(U) Reductive Coupling of Carbonyl Compounds with Zinc and Trimethylchlorosilane to Produce O-Silylated Pinacols. Effect of Ultrasonic Waves.

88

PERSONAL AUTHORS: So. Jeung-Ho; Park, Moon-Kyeu; Boudjouk, Philip

CONTRACT NO. AFOSR-88-0060

PROJECT NO. 2303

TASK NO. 82

MONITOR: AFOSR  
TR-89-0370

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Organic Chemistry, v53 p5871-5875 1988.

ABSTRACT: (U) Trimethylchlorosilane reacts with carbonyl compounds in the presence of zinc to give O-silylated pinacols, vicinal bis(trimethylsiloxy)alkanes, in good yields via reductive dimerization. This is a very mild route to bis(siloxy)alkanes, which are easily converted to pinacols or pinacolones in excellent yields. Electron-donating groups accelerate coupling while electron-withdrawing groups have an inhibiting effect. Cross-coupling reactions yield a mixture of bis(siloxy)alkanes. Ultrasonic irradiation of these reactions increases the yields up to 50% compared to stirring at the same temperature. Silanes, Methyl radicals, Chlorine compounds, Preprints. (mj/m)

DESCRIPTORS: (U) 'SILANES, 'METHYL RADICALS, 'CARBONYL COMPOUNDS, ZINC, CHEMICAL REACTIONS.

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SRI INTERNATIONAL MENLO PARK CA

(U) Free Radical-Surface Interactions Using Multiphoton Ionization of Free Radicals.

DESCRIPTIVE NOTE: Final technical rept. 1 Oct 85-30 Sep 88.

JAN 89

PERSONAL AUTHORS: Robertson, Robert M.; Golden, David M.; Rossi, Michael J.

CONTRACT NO. F49620-86-K-0001

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-89-0302

UNCLASSIFIED REPORT

ABSTRACT: (U) Free Radical and Atom Surface interactions have been studied in a low pressure reactor (Knudsen cell) where the atomic and molecular transients predominantly collide with the walls of the reaction vessel. The approach taken involved generating the neutral transients using IR-multiphoton decomposition of an appropriate precursor and subsequently exposing the photolysis products to given surfaces at variable temperature (ambient to 450 C). The detection was performed by molecular beam sampling mass spectrometry and in situ Resonance enhanced Multiphoton Ionization using a tunable dye laser. The combination of both techniques affords the possibility to determine the kinetics of the neutral transients in quantitative terms, that is competition between first order and second-order processes, and the determination of quantitative REMPI ionization cross sections. The heterogeneous loss rate constants are cast in the form of a sticking coefficient for a specific radical on a given surface. We have investigated the interaction of CF<sub>3</sub> radical on SiO<sub>2</sub> and Si over a range of temperatures. SiH<sub>2</sub> has been investigated in its interaction with solid Si- containing surfaces, and I and Br atoms have been studied as to their reaction with various surfaces. Sticking coefficients, Free radicals

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atoms. Cross section. Silicon. Carbon trifluoride.  
Silicon dioxide. (mjm)

DESCRIPTORS: (U) CARBON, FLUORIDES, FREE RADICALS,  
PHOTOIONIZATION, SILICON, SILICON DIOXIDE, ATOMS,  
CHEMICAL RADICALS, COEFFICIENTS, CONSTANTS, CROSS  
SECTIONS, DETECTION, DYE LASERS, HETEROGENEITY,  
INTERACTIONS, IONIZATION, KNUDSEN GAGES, LOSSES, NEUTRAL,  
PHOTOLYSIS, RATES, SURFACE CHEMISTRY, SURFACES,  
TEMPERATURE, TRANSIENTS, TUNABLE LASERS, VARIABLES, WALLS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B1, LPN-PYU-1227,  
Carbon trifluoride.

SIBLEY SCHOOL OF MECHANICAL AND AEROSPACE ENGINEERING  
ITHACA NY

(U) An Algorithm for Tracking Fluid Particles in Numerical  
Simulations of Homogeneous Turbulence.

DEC 88

PERSONAL AUTHORS: Yeung, P. K.; Pope, Steven B.

CONTRACT NO. AFOSR-85-0083

PROJECT NO. 2308

TASK NO. A2

MONITOR: AFOSR  
TR-89-0322

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Computational Physics,  
v79 n2 p373-415 Dec 88.

ABSTRACT: (U) Lagrangian statistical quantities are of  
fundamental physical importance in our understanding of  
turbulence, but are very difficult to measure and hence  
infrequently reported in the literature. A particle-  
tracking algorithm is developed to extract accurate  
Lagrangian statistics from numerically calculated  
velocity fields. Lagrangian time-series are obtained from  
the method of direct numerical simulation, which supplies  
the Eulerian velocity field on a three-dimensional grid  
network. The accuracy of the Lagrangian time series  
depends primarily on the accuracy of the interpolation  
scheme used to calculate fluid-particle velocities.  
Interpolation schemes based on Taylor series and on cubic  
splines have been implemented and tested. Errors in  
computed particle displacement are quantified for simple  
frozen velocity fields. The algorithm is applied to  
stationary homogeneous isotropic turbulence with the  
energy maintained by artificial forcing. It is  
demonstrated that with adequate spatial resolution,  
accurate estimates of Lagrangian statistics such as  
velocity autocorrelations, structure functions, and  
frequency spectra can be obtained either with a third-  
order Taylor series interpolation scheme or with a cubic  
spline scheme. Cubic splines give higher interpolation

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accuracy, but they are difficult to implement in codes that rely on secondary storage. Keywords: Numerical simulation; Lagrangian; Turbulence; Reprints. (JHD)

DESCRIPTORS: (U) \*DIGITAL SIMULATION, \*TRACKING, \*TURBULENCE, ACCURACY, ALGORITHMS, AUTOCORRELATION, CUBIC SPLINE TECHNIQUE, DISPLACEMENT, ESTIMATES, FLUIDS, GRIDS, HOMOGENEITY, INTERPOLATION, ISOTROPISM, LAGRANGIAN FUNCTIONS, NETWORKS, PARTICLES, REPRINTS, RESOLUTION, SECONDARY, SPATIAL DISTRIBUTION, STATIONARY, STATISTICAL DATA, STATISTICS, STORAGE, TAYLORS SERIES, THREE DIMENSIONAL, TIME SERIES ANALYSIS, VELOCITY.

IDENTIFIERS: (U) PE61102F, WUAFOSR2308A2.

PENNSYLVANIA STATE UNIV UNIVERSITY PARK DEPT OF MECHANICAL ENGINEERING

(U) Optical Measurements of Soot Particles in Flames.

88

PERSONAL AUTHORS: Santoro, Robert J.

CONTRACT NO. AFOSR-87-0145

PROJECT NO. 2308

TASK NO. A2

MONITOR: AFOSR  
TR-89-0323

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Proceedings of Materials Research Society Symposium, v117 p157-163 1988.

ABSTRACT: (U) The formation and growth of soot particles in combustion systems represents an area of significant research interest. Critical to progress in this area has been development of suitable optical diagnostic techniques. Principal among this has been the utilization of laser light scattering techniques to obtain particle size and concentration information. When combined with measurements of other quantities such as the velocity, the resulting spatially and temporally resolved measurements can be used to examine particle processes such as coagulation and surface growth. In the present work, the results from studies conducted in laminar diffusion flames involving laser based measurements of the soot particle and velocity fields are reviewed. As an example of the utility of such an approach, these results are used to examine the evolution of the particle surface area for a series of simple hydrocarbon fuels. The results indicate that the available surface area varies strongly with the fuel molecular structure. However, the specific surface growth rate is observed to be similar for all the fuels studied. Diagnostics, Optical techniques, Soot formation, Reprints. (mjm)

DESCRIPTORS: (U) \*DIAGNOSIS(GENERAL), \*FLAMES, \*PARTICLES, \*SOOT, COAGULATION, COMBUSTION, DIFFUSION,

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FUELS, GROWTH(GENERAL), HYDROCARBONS, LAMINAR FLOW,  
LASERS, LIGHT SCATTERING, MEASUREMENT, METHODOLOGY,  
MOLECULAR STRUCTURE, OPTICAL PROPERTIES, OPTICS, PARTICLE  
SIZE, RATES, REPRINTS, SURFACES, VELOCITY.

MICHIGAN UNIV ANN ARBOR DEPT OF AEROSPACE ENGINEERING

(U) Structure of the Near-Injector Region of Non-  
Evaporating Pressure-Atomized Sprays.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2308A2.

JAN 89

PERSONAL AUTHORS: Ruff, G.; Bernal, L.; Faeth, G.

CONTRACT NO. AFOSR-85-0244

PROJECT NO. 2308

TASK NO. A2

MONITOR: AFOSR  
TR-89-0324

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Aerospace Sciences Meeting  
(27th), January 9-12 1989.

ABSTRACT: (U) The dense-spray region of pressure-atomized nonevaporating sprays in the atomization breakup regime was studied, emphasizing the properties of the multiphase mixing layer which surrounds the all-liquid core. The dispersed-phase properties of a large-scale (9.5 mm injector diameter) water jet injected vertically down in still air was measured using double-flash holography. The inner portion of the mixing layer contained large irregularly-shaped liquid elements and drops with the proportion of drops increasing and drop sizes decreasing with increasing radial distance. The all-liquid core and the liquid elements cause mean liquid volume fractions to be high near the axis; however, the gas-containing region is relatively dilute at each instant. The velocities of large drops are generally much larger than small drops and predictions based on the locally-homogeneous-flow approximation, providing direct evidence of significant separated-flow effects. Multiphase flow, Sprays, Reprints. (mjn)

DESCRIPTORS: (U) 'MULTIPHASE FLOW, 'SPRAYS, 'WATER JETS, AIR, ATOMIZATION, DROPS, LAYERS, LIQUIDS, MEAN, MIXING, PHASE, RANGE(DISTANCE), REPRINTS, VELOCITY.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2308A2.

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STATE UNIV OF NEW YORK AT BUFFALO DEPT OF PHYSICS AND ASTRONOMY

CALIFORNIA UNIV SAN DIEGO LA JOLLA

(U) Effect of Finite Size on Magnetoresistance.

(U) Establishment of an Electron Beam Lithography Facility.

FEB 89

FEB 89

PERSONAL AUTHORS: Lee, H. R.; Oh, H. G.; George, Thomas F.; Um, C. I.

PERSONAL AUTHORS: Lee, Sing H.

CONTRACT NO. F49620-86-C-0009

CONTRACT NO. AFOSR-87-0060

PROJECT NO. 2303

PROJECT NO. 2305

TASK NO. B3

TASK NO. B1

MONITOR: AFOSR  
TR-89-0368

MONITOR: AFOSR  
TR-89-0343

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Physical Review B, v39 n4 p2822-2825, 1 Feb 89.

ABSTRACT: (U) Enclosed is a final report on testing of an electron beam writer. This electron beam writer will be used to produce high resolution, large space bandwidth product holographic optical elements (which are versatile, passive components of opto-electronic systems), to fabricate fast, compact, active opto-electronic devices and to make masks for high speed millimeter wave devices or high frequency integrated circuits, as described in the original proposal. (jhd)

ABSTRACT: (U) Finite size effects are studied for Magnetoresistance in a disordered metallic system. Quantum corrections to the conductivity are strongly affected by the presence of an in-plane magnetic field in a thin film. They are also affected significantly by the boundaries of the finite quantum size. Expressions are obtained for the quantum correction to the conductivity due to both effects. The dephasing characteristic time scale due to the magnetic field is found by the exact eigenvalues of the system. One-two- and three-dimensional results can be obtained with the proper limits. Some numerical results are presented for the given inelastic scattering length. Keywords: Magnetoresistance; Finite size effects; Metallic system; Disordered; Conductivity; Quantum corrections; Reprints. (JHD)

DESCRIPTORS: (U) \*MAGNETORESISTANCE, \*QUANTUM ELECTRONICS, \*ELECTRICAL CONDUCTIVITY, CORRECTIONS, EIGENVALUES, INELASTIC SCATTERING, LENGTH, MAGNETIC FIELDS, METALS, NUMERICAL ANALYSIS, ORDER DISORDER TRANSFORMATIONS, REPRINTS, THIN FILMS, THREE DIMENSIONAL.

IDENTIFIERS: (U) PE61102F, WUAFOSR230383, Metallic systems.

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CHICAGO UNIV IL JAMES FRANCK INST

(U) Dynamics of Gas-Surface Interactions.

DESCRIPTIVE NOTE: Final technical rept. 1 Apr 84-31 May 88.

FEB 89

PERSONAL AUTHORS: Sibener, S. J.

CONTRACT NO. AFOSR-84-0073

PROJECT NO. 2303

TASK NO. A2

MONITOR: AFOSR  
TR-89-0317

UNCLASSIFIED REPORT

ABSTRACT: (U) This research initiative has dealt with the interaction of atomic, molecular, electron, and optical beams with well-characterized single crystal surfaces. These studies were motivated by a desire to understand and control catalytic surface chemistry, the technological need to characterize the physical properties of thin films and surfaces, and the desire to understand how energy and momentum are exchanged at the surface of a material when it is subjected to gas-surface collisions, electron-surface collisions, optical illumination, or chemical reaction. During the past grant period, two major new scattering instruments were completed. One is a high performance neutral particle scattering apparatus, which routinely achieves an energy resolution of ca. 300 micro-eV. It has successfully performed elastic and inelastic scattering measurements on alkali halide, semiconductor, and metallic surfaces. Results are presented in this final report for Lithium Fluoride (001), Silicon (001)-(2x1), and Silver (110). The Si phonon dispersion measurements differ markedly from theoretical calculations, and strongly suggest that the dynamical properties of partially disordered surfaces merit increasing attention in this program. Gas surface interactions. Electron surface interactions. Inelastic scattering. Gas surface energy transfer. Surface phonons. Lithium fluoride, Silicon, Silver. (mjm)

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DESCRIPTORS: (U) \*DYNAMICS, \*GAS SURFACE INTERACTIONS, \*LITHIUM FLUORIDES, \*SILICON, \*SILVER, ALKALI METAL COMPOUNDS, BEAMS(ELECTROMAGNETIC), CATALYTIC CRACKING, CHEMICAL REACTIONS, COLLISIONS, COMPUTATIONS, CONTROL, DISPERSING, ELASTIC PROPERTIES, ELECTRONS, ENERGY, ENERGY TRANSFER, GASES, HALIDES, ILLUMINATION, INELASTIC SCATTERING, INSTRUMENTATION, INTERACTION, MEASUREMENT, METALS, MOMENTUM, OPTICAL EQUIPMENT, OPTICAL PROPERTIES, PHONONS, PHYSICAL PROPERTIES, RESOLUTION, SCATTERING, SINGLE CRYSTALS, SURFACE CHEMISTRY, SURFACE ENERGY, SURFACE PROPERTIES, SURFACES, THEORY, THIN FILMS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303A2.

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VANDERBILT UNIV NASHVILLE TN DEPT OF CHEMISTRY

COLUMBIA UNIV NEW YORK DEPT OF CHEMISTRY

(U) Reduced Potential-Energy Curves for Diatomic Molecules,

(U) Ultrafast Chemical Reactions in the Liquid State,

FEB 89

88

PERSONAL AUTHORS: Tellinghuisen, Joel; Henderson, Stuart  
D.; Austin, Derek; Lawley, Kenneth P.; Donovan, Robert J.

PERSONAL AUTHORS: Eysenthal, Kenneth B.

CONTRACT NO. F49620-86-C-0125

CONTRACT NO. AFOSR-88-0014

PROJECT NO. 3484

PROJECT NO. 2303

TASK NO. A2

TASK NO. B2

MONITOR: AFOSR  
TR-89-0372

MONITOR: AFOSR  
TR-89-0359

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Physical Review A, v39 n3  
p925-930, 1 Feb 89.

SUPPLEMENTARY NOTE: Pub. in Topics in Applied Physics,  
v60: Ultrashort Laser Pulses and Applications, p319-356  
1988.

ABSTRACT: (U) A simple prescription for scaling diatomic  
potentials so that they have a common dissociation limit  
and fixed curvature near the minimum is used to examine  
35 diatomic potentials which are known over relatively  
large fractions of their well depths. These global  
comparisons reveal greater similarity, particularly among  
chemically related molecules, than might be predicted  
from spectroscopic properties that are based on  
derivatives of the potential near its minimum. Keywords:  
Potential energy curves, Diatomic molecules, Scaled  
potentials. Reprints. (MUM)

ABSTRACT: (U) The aim of this chapter is to provide some  
feeling for the impact of picosecond lasers on studies of  
chemical phenomena in liquids. Reprints. (MUM)

DESCRIPTORS: (U) \*DIATOMIC MOLECULES, \*DISSOCIATION,  
\*SCALING FACTORS, CURVATURE, DEPTH, LIMITATIONS,  
MOLECULES, REPRINTS, SPECTROSCOPY.

DESCRIPTORS: (U) \*CHEMICAL REACTIONS, \*LASERS, \*LIQUIDS,  
CHEMICALS, HIGH RATE, REPRINTS.

IDENTIFIERS: (U) PE61102F, WUAFOSR3484A2.

IDENTIFIERS: (U) WUAFOSR2303B2, PE61102F.

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## BOSTON UNIV MA CENTER FOR ADAPTIVE SYSTEMS

## BOSTON UNIV MA CENTER FOR ADAPTIVE SYSTEMS

(U) Sustained Oscillations in a Symmetric Cooperative-Competitive Neural Network: Disproof of a Conjecture About Content Addressable Memory.

(U) Self-Organizing Neural Architectures for Eye Movements, Arm Movements, and Eye-Arm Coordination.

88

PERSONAL AUTHORS: Cohen, Michael A.

PERSONAL AUTHORS: Grossberg, Stephen; Bullock, Daniel

CONTRACT NO. F49620-86-C-0037

CONTRACT NO. F49620-86-C-0037, F49620-87-C-0018

MONITOR: AFOSR  
TR-89-0334

MONITOR: AFOSR  
TR-89-0333

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Neural Networks, v1 p217-221 1988.

SUPPLEMENTARY NOTE: Pub. in Neural and Synergetic Computers, p197-228 1988.

ABSTRACT: (U) Cohen and Grossberg proved that a large class of neural networks with symmetric interaction coefficients admit a global Liapunov function guaranteeing that their trajectories approach equilibrium points. Such networks function as content-addressable memories, and the equilibria are the stored memories. Cohen and Grossberg also conjectured, based upon substantial computational evidence, that networks within a class of mixed cooperative-competitive networks with symmetric interaction coefficients also have this property. This conjecture is here disproved. In particular, a class of homogeneous, distance-dependent, on-center off-surround neural networks are constructed which supports persistent oscillations for appropriate initial data. Such a class is constructed in each even dimension. Similar systems, which have been used to model the dynamics of the hippocampus, are compared to this class of networks to clarify the origins of oscillatory class of behavior in this class of systems. Reprints. (UHD)

DESCRIPTORS: (U) \*ADDRESSING, \*NEURAL NETS, \*MEMORY DEVICES, BEHAVIOR, COEFFICIENTS, COMPUTATIONS, DYNAMICS, FUNCTIONS, HIPPOCAMPUS, INTERACTIONS, NETWORKS, OSCILLATION, REPRINTS, SIZES(DIMENSIONS), SYMMETRY, LYAPUNOV FUNCTIONS.

IDENTIFIERS: (U) PE61102F, Addressable memories.

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BOSTON UN:V MA CENTER FOR ADAPTIVE SYSTEMS

(U) Neural Networks for Visual Perception in Variable Illumination,

AUG 88

DESCRIPTORS: (U) \*CYBERNETICS, \*NEURAL NETS, \*VISION, \*VISUAL PERCEPTION, ARCHITECTURE, AUTOMATIC, COMMUNITIES, FAULTS, HUMANS, ILLUMINATION, INTERNATIONAL, LEARNING, CONTRAST, MACHINES, MODELS, NERVOUS SYSTEM, OPTICAL IMAGES, OPTICS, PARALLEL PROCESSING, SOCIETIES, SOLUTIONS(GENERAL), TOLERANCE, UNITED STATES, VARIABLES.

PERSONAL AUTHORS: Grossberg, Stephen

IDENTIFIERS: (U) PE61102F.

CONTRACT NO. F49620-86-C-0037, F49620-87-C-0018

MONITOR: AFOSR  
TR-89-0332

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Optics News, v14 n8 p1-10 Aug 88.

ABSTRACT: (U) On March 16, 1987, the International Neural Network Society (INNS) was formed. Members began to join in July, 1987. By April 1988, only 10 months later, there were over 2000 members from 34 countries and 47 states of the United States. Many engineers have been drawn to the field because neural network researchers have discovered promising approaches to the many types of problems for which adaptive, massively parallel, fault tolerant solutions are needed, and for which neural networks will run in real-time when they are realized compactly in specialized hardware. The most advanced neural network architectures are providing examples of intelligent systems capable of autonomous learning and skillful performance within complex and noisy environments that are not under strict control. Such examples and future possibilities have helped to generate a high level of enthusiasm among people working in the field. In this article, a briefly discuss some recent results from a type of neural model that may be of particular interest to the optics community: Neural models of vision. Two of the central goals of visual science are to understand how human vision works and to develop automatic vision machines for applications in technology. These two goals have merged into one through the recent discovery and progressive characterization of a neural network architecture to explain the processes of preattentive vision. Keywords: Cybernetics; Parallel processing. (kt)

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PERGAMON PRESS INC ELMSFORD NY

IOWA STATE UNIV AMES DEPT OF AEROSPACE ENGINEERING

(U) Annual Review of Chronopharmacology. Volume 5.

(U) Three Dimensional High Speed Boundary Layer Flows.

DESCRIPTIVE NOTE: Final rept. 1 Mar 88-28 Feb 89.

DESCRIPTIVE NOTE: Final rept. Sep 85-May 88.

FEB 89

SEP 88

PERSONAL AUTHORS: Reinberg, A.; Smolensky, M.; Labrecque, G.

PERSONAL AUTHORS: Inger, George R.

CONTRACT NO. AFOSR-88-0123

CONTRACT NO. AFOSR-85-0357

PROJECT NO. 2312

PROJECT NO. 2307

TASK NO. A2

TASK NO. A1

MONITOR: AFOSR  
TR-89-0363MONITOR: AFOSR  
TR-89-0287

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

Availability: Pergamon Press, Customer Services, Elmsford, NY 10523. HC \$150.00. No copies furnished by DTIC.

ABSTRACT: (U) The Proceedings of the Third International Conference of Chronopharmacology contains 135 short reports of papers or posters presented at the meeting held in Nîmes, France, 14-17 March 1988. This meeting covered all aspects of chronopharmacology and was attended by over 200 participants from around the world. The proceedings are published as Volume 5 of the Annual Review of Chronopharmacology by Pergamon Press. Keywords: Proceedings; Symposia; Pharmacology. (kt)

DESCRIPTORS: (U) +PHARMACOLOGY, INTERNATIONAL, REPORTS, SYMPOSIA.

IDENTIFIERS: (U) Chronopharmacology, WUAFOSR2312A2, PE61102F.

ABSTRACT: (U) This final report summarizes the research results obtained by a two-faceted basic theoretical investigation involving (1) fundamental analyses of three-dimensional viscous-inviscid interaction effects within high speed turbulent boundary layers and (2) study of the influence of streamwise vortex arrays on the skin friction within attached or separated laminar layer flows. Keywords: Viscous inviscid interactions, High speed, Turbulent Boundary layers, Vortex arrays. (JHD)

DESCRIPTORS: (U) +TURBULENT BOUNDARY LAYER, +VORTICES, ARRAYS, INTERACTIONS, INVISCID FLOW, SKIN FRICTION, THREE DIMENSIONAL, VISCOUS FLOW.

IDENTIFIERS: (U) WUAFOSR2307A1, PE61102F.

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AD-A206 102 4/2 12/6

BOSTON UNIV MA CENTER FOR ADAPTIVE SYSTEMS

ATMOSPHERIC AND ENVIRONMENTAL RESEARCH INC CAMBRIDGE MA

(U) Self-Organizing Neural Network Architectures for Real-Time Adaptive Pattern Recognition.

(U) On the Use of Multiprocessing Computers for Global Numerical Weather Prediction.

88

DESCRIPTIVE NOTE: Final rept. Aug 88-Jan 89.

PERSONAL AUTHORS: Carpenter, Gail A.; Grossberg, Stephen

FEB 89

CONTRACT NO. F49620-86-C-0037, F49620-87-C-0018

PERSONAL AUTHORS: Hoffman, Ross N.; Nehr Korn, T.

MONITOR: AFOSR  
TR-89-0339

REPORT NO. P248-FR

UNCLASSIFIED REPORT

CONTRACT NO. F49620-88-C-0105

PROJECT NO. 3005

SUPPLEMENTARY NOTE: Pub in Neural and Synergetic Computers. p42-74 1988. Sponsored in part by Contract DAAG29-85-K-0095 and NSF-DMS86-11959.

TASK NO. A1

MONITOR: AFOSR  
TR-89-0272

ABSTRACT: (U) The Adaptive Resonance Theory (ART) architectures that are discussed herein are neural networks that self-organize stable recognition codes in real-time in response to arbitrary sequences of input patterns. Within such an ART architecture, the process of adaptive pattern recognition is a special case of the more general cognitive process of hypothesis discovery, testing, search, classification, and learning. This latter property opens the possibility of applying ART systems to more general problems of adaptively processing large abstract information sources and data bases. This document outlines the main computational properties of these ART architectures. ART models grew out of an analysis of a simpler type of adaptive pattern recognition network which is often called a competitive learning model. Keywords: Reprints, Translations, West Germany. (kr)

DESCRIPTORS: (U) COMPUTER ARCHITECTURE, NEURAL NETS, SELF ORGANIZING SYSTEMS, ADAPTIVE SYSTEMS, COGNITION, COMPUTATIONS, DATA BASES, HYPOTHESES, INPUT, LEARNING, MODELS, NETWORKS, PATTERN RECOGNITION, PATTERNS, REAL TIME, REPRINTS, RESONANCE, SEQUENCES, THEORY, TRANSLATIONS, WEST GERMANY.

IDENTIFIERS: (U) PE61102F

UNCLASSIFIED REPORT

ABSTRACT: (U) A preliminary exploration is made of the uses of multiprocessing computers for large scale NWP using spectral models. In general if global communication between processors is relatively fast and easy, then implementing spectral models is feasible. The global spectral model is recast in terms of latitude and wavenumber tasks. This approach has a number of advantages: The entire algorithm is macrotasked. Only a handful of crucial pointers need to be locked. The spectral transform calculations are localized so that arithmetic always follows the same ordering and all results are exactly reproducible. The latitude wavenumber tasking scheme is implemented and tested on the Sequent Balance, a shared memory multiple instruction multiple data device. It is argued that this scheme could be easily extended and applied to larger machines of this class and provide a good starting point for distributed memory machines. The potential of single instruction multiple data machines is huge. A proposed algorithm for this class of machine uses a processor for each horizontal grid point. Keywords: Numerical weather prediction; Multiprocessors; Atmosphere models; Weather forecasting. (edc)

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DESCRIPTORS: (U) \*MULTIPROCESSORS, \*WEATHER FORECASTING, ALGORITHMS, ATMOSPHERE MODELS, COMPUTERS, DISTRIBUTION, GLOBAL, GLOBAL COMMUNICATIONS, GRIDS(COORDINATES), HORIZONTAL ORIENTATION, LATITUDE, MACHINES, MATHEMATICAL PREDICTION, MEMORY DEVICES, NUMERICAL ANALYSIS, SPECTRA.

IDENTIFIERS: (U) Distributed memory machines. Numerical weather prediction. WUAFOSR3005A1, PE61102F.

AD-A206 101 7/3 11/2 21/4

STATE UNIV OF NEW YORK AT BINGHAMTON DEPT OF CHEMISTRY

(U) Novel Organoboranes as Intermediates for Ceramic Precursors and High-Energy Fuels.

DESCRIPTIVE NOTE: Final technical rept. 1 Feb 85-31 Aug 88.

JAN 89

PERSONAL AUTHORS: Eisch, John J.

CONTRACT NO. AFOSR-85-0108

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-89-0234

UNCLASSIFIED REPORT

ABSTRACT: (U) This project investigated, as its primary objective, the influence of carbon-boron bonding in unsaturated, cyclic boranes on the energy content of this system. Such insights should aid the choice of the best carbon-boron clusters to be incorporated into high-energy fuels. The synthesis and structural characterization of the following boron-containing carbocycles were undertaken: The borirene or boracyclopentene system, as exemplified by trimesitylborirene; the borole or boracyclopentadiene ring, as represented by pentaarylboroles; the borepin or boracycloheptatriene nucleus, as seen in heptaphenylborepin; the 7-borabicyclo 2.2.1 heptadiene system, again typified by its heptaryll derivative; and the 1-borotetrahydronaphthalene derivative, which was the thermal rearrangement product of the borepin. As estimated by chemical reactivity towards heat, oxidants and protolyzing agents, the borirene and borole nuclei display unusual stability and thus can be termed aromatic. The boroles are very reactive and possess destabilization or be antiaromatic. A rich variety of both thermal and photochemical skeletal rearrangements was uncovered with these boracyclopolyenes, indicating that tricoordinate boron has a pronounced tendency to interact either intermolecularly or intramolecularly, with pi-electrons. As a secondary

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objective, bimetallic oxides of the type, R2M-O-M'R2, were synthesized and evaluated as hydrocarbon-soluble precursors to specialized ceramics. (aw)

DESCRIPTORS: (U) \*CERAMIC MATERIALS, \*FUELS, \*ORGANOBORANES, \*SYNTHESIS(CHEMISTRY), BIMETALS, CHEMICAL REACTIONS, DISPLAY SYSTEMS, ESTIMATES, HIGH ENERGY, NUCLEI, OXIDES, OXIDIZERS, PRECURSORS, REACTIVITIES, CHEMICAL BONDS, CLUSTERING, CYCLIC COMPOUNDS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B2, Borirene, Boracyclopropene, Boririne/trimesityl, Propene/boracyclo, Heptadienes, Naphthalene/1-boratetrahydro, Borepin, Heptatriene/boracyclo, Borepin/heptaphenyl, Boroles, Boracyclopolyenes, Pentadiene/boracyclo.

AD-A206 100 20/11 20/13

TEXAS A AND M UNIV COLLEGE STATION MECHANICS AND MATERIALS CENTER

(U) Experimental and Theoretical Determination of the Thermomechanical Response of Inelastic Structural Materials to High Energy Thermal Inputs.

DESCRIPTIVE NOTE: Semi-annual technical rept. Jul-Dec 88.

DEC 88

PERSONAL AUTHORS: Allen, D. H.; Pilant, M. S.

REPORT NO. MM 5485-88-10

CONTRACT NO. F49620-86-K-0016

PROJECT NO. 2302

TASK NO. B1

MONITOR: AFOSR  
TR-89-0140

UNCLASSIFIED REPORT

ABSTRACT: (U) The general objective of this research is to improve on existing theoretical models for predicting the response of inelastic aerospace structural components subjected to hostile thermal environments with emphasis on transient temperature conditions, radiation boundary conditions, extremely rapid heating rates, and possible phase change of the materials involved. For materials subjected to the conditions under study herein it is necessary to perform extremely complex experiments in order to determine the precise form of the theoretical constitutive equations. Finally, it is necessary to implement the resulting equations to boundary value problem solving algorithms in order to model the response of structural components with stress, strain, and temperature gradient fields. Laser heating, viscoplasticity, finite element methods, Constitutive properties, Heat transfer, Thermomechanics. (mjm)

DESCRIPTORS: (U) \*AEROSPACE CRAFT, \*ELASTIC PROPERTIES, \*HEAT TRANSFER, \*STRUCTURAL MEMBERS, \*THERMOMECHANICS, ADVERSE CONDITIONS, BOUNDARIES, CONSTRUCTION MATERIALS, EQUATIONS, FINITE ELEMENT ANALYSIS, HEAT, HEATING, HIGH

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ENERGY, HIGH RATE, LASERS, MODELS, PHASE TRANSFORMATIONS,  
RADIATION, RESPONSE, TEMPERATURE, TEMPERATURE GRADIENTS,  
THEORY, TRANSIENTS, VISCOPLASTIC PROPERTIES.

PITTSBURGH UNIV PA DEPT OF MATERIALS SCIENCE AND  
ENGINEERING

(U) Environmental Effects in Niobium Base Alloys and Other  
Selected Intermetallic Compounds.

IDENTIFIERS: (U) PE61102F, WUAFOSR230281.

DESCRIPTIVE NOTE: Annual rept. no. 1, 1 Nov 87-31 Oct 88,

DEC 88

PERSONAL AUTHORS: Meier, G. H.; Thompson, A. W.

CONTRACT NO. F49620-88-C-0013, DARPA Order-6155

MONITOR: AFOSR  
TR-89-0366

UNCLASSIFIED REPORT

ABSTRACT: (U) Niobium aluminides and silicides as well as other intermetallic compounds have potential for use in advanced gas turbines where increased operating temperatures are necessary to obtain the targeted performance goals. These materials will be subjected to a variety of environments over a range of temperatures. Two of the principal reactants in these environments are oxygen and hydrogen. This program is concerned with the effects of oxygen and hydrogen on niobium alloys and other selected intermetallic compounds. This program consists of two parts. The investigations involving oxygen are directed toward describing the conditions which must be achieved in order to have a continuous, protective Aluminum Oxide or Silicon dioxide scale developed on niobium-base alloys and compounds, and other selected intermetallics, at temperatures between 600 and 1400 C. The studies concerned with hydrogen effects are directed toward determining solubility limits, hydrogen uptake and permeation rates, and the degree to which hydrogen degrades the mechanical properties of these materials. (aw)

DESCRIPTORS: (U) 'ALUMINIDES, 'INTERMETALLIC COMPOUNDS, 'NIOBIUM ALLOYS, 'SILICIDES, 'ENVIRONMENTAL TESTS, ALUMINUM OXIDES, ENVIRONMENTAL IMPACT, GAS TURBINES, HYDROGEN, LIMITATIONS, MECHANICAL PROPERTIES, NIOBIUM, OXYGEN, PERMEABILITY, RATES, SCALE, SILICON DIOXIDE, SOLUBILITY, TEMPERATURE, CHEMICAL ATTACK(DEGRADATION).

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IDENTIFIERS: (U) PES1102F

AIR FORCE GEOPHYSICS LAB HANSCOM AFB MA

(U) Plasma Simulation of Ion Acceleration by Lower Hybrid Waves in the Supraauroral Region,

SEP 88

PERSONAL AUTHORS: Retterer, John M.; Chang, Tom; Jasperse, John R.

REPORT NO. AFGL-TR-88-0250

MONITOR: AFOSR  
TR-88-0250

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Ion Acceleration in the Magnetosphere and Ionosphere, p282-285 1986.

ABSTRACT: (U) The generation of lower hybrid waves below field aligned potential drops and the effect of the resulting turbulence on the ion population in the supraauroral region are studied using particle plasma simulations. To describe the ion acceleration observed in the simulation, a theoretical model is developed using mode-mode coupling processes to generate the low phase velocity VLF waves with which the ions first interact. By scaling the simulation results, we show that interaction between the ions and the lower hybrid waves can account for the acceleration necessary to produce supraauroral ion conic events. Keywords: Plasma simulation; Ion acceleration; Lower hybrid waves; Supraauroral region. Reprints. (JHD)

DESCRIPTORS: (U) \*AURORAE, \*PLASMA WAVES, \*IONOSPHERIC DISTURBANCES, ACCELERATION, COUPLING(INTERACTION), HYBRID SYSTEMS, IONS, IONOSPHERIC MODELS, PARTICLES, PLASMAS(PHYSICS), POPULATION, REPRINTS, SIMULATION, THEORY, TURBULENCE, WAVES, VERY LOW FREQUENCY.

IDENTIFIERS: (U) Ion conics, Hybrid waves.

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AD-A206 062

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STANFORD UNIV CA DEPT OF MATERIALS SCIENCE AND  
ENGINEERING

AD-A206 021 20/4

STANFORD UNIV CA DEPT OF MECHANICAL ENGINEERING

(U) Fundamental Studies of the Mechanical Behavior of  
Microelectronic Thin Film Materials.

(U) The Dimension of Attractors Underlying Turbulent  
Poiseuille Flow.

DESCRIPTIVE NOTE: Final technical rept. Jan 86-Dec 88.

DESCRIPTIVE NOTE: Final rept. 1 Dec 87-30 Jan 89.

JAN 89

FEB 89

PERSONAL AUTHORS: Nix, William D.

PERSONAL AUTHORS: Keefe, Laurence; Moin, Parviz

CONTRACT NO. AFOSR-86-0051

CONTRACT NO. AFOSR-88-0056

MONITOR: AFOSR  
TR-89-0365

PROJECT NO. 2307

TASK NO. A2

MONITOR: AFOSR  
TR-89-0304

UNCLASSIFIED REPORT

ABSTRACT: (U) It is appropriate to note that before this research program began, very little work had been done in universities on the mechanical properties of microelectronic thin film materials. As a result, much of our early work involved the development of experimental techniques, such as sub micron indentation and wafer curvature measurement, to study stresses and mechanical properties of thin films on substrates. Interest in these developments is indicated by the accepted publications and invited oral presentations listed at the end of this report. The recent MRS Symposium on Thin Films: Stresses and Mechanical Properties was an outgrowth of the research work started under this grant. Thin films, Microelectronics, Mechanical behavior. (mjml)

DESCRIPTORS: (U) 'CURVATURE, 'MATERIALS, 'MECHANICAL PROPERTIES, 'MICROELECTRONICS, 'STRESSES, 'SUBSTRATES, 'THIN FILMS, 'WAFERS, EXPERIMENTAL DESIGN, MEASUREMENT, METHODOLOGY, SYMPOSIA, UNIVERSITIES.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2306A1.

AD-A206 057

UNCLASSIFIED

UNCLASSIFIED REPORT

ABSTRACT: (U) It is shown that fully developed channel flow is confined to a strange attractor. However, the dimension of the attractor is much larger than dimensions encountered in closed flows such as Benard Convection and Taylor-Couette flow. In addition, we have examined the relationship between turbulent structures and attractor geometry. In the end, what is sought from any theory of turbulence is a universal framework that allows known phenomena to be understood, calculated, and related, and a predictive capability for unknown flows or control measures. Crucial to the erection of such a structure is a knowledge of the fundamental mathematical character of a turbulence. The purpose of this research has been to investigate this character to determine if chaos theory and the strange attractor can provide the foundation for such a global theory. (JES)

DESCRIPTORS: (U) 'CHANNEL FLOW, CONTROL, CONVECTION, FLOW, GLOBAL, MATHEMATICAL ANALYSIS, PREDICTIONS, STRUCTURES, THEORY, TURBULENCE.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2307A2, 'POISEUILLE FLOW.

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CITY OF HOPE BECKMAN RESEARCH INST DUARTE CA

(U) Long Term Synaptic Plasticity and Learning in Neuronal Networks.

DESCRIPTIVE NOTE: Final technical rept. 15 Aug 86-14 Nov 88.

JAN 89

PERSONAL AUTHORS: Brown, Thomas H.

CONTRACT NO. F49620-86-C-0099

PROJECT NO. 2312

TASK NO. A1

MONITOR: AFOSR  
TR-89-0361

# UNCLASSIFIED REPORT

ABSTRACT: (U) The purpose of this project was to understand rapidly induced and persistent forms of synaptic memory. The properties of the synaptic modifications underlying this plasticity could account for some of the adaptive and self organizing capabilities of simple and well-defined neurobiological networks in the mammalian brain. These can be studied rigorously using neurophysiological and optical techniques. Spearheading the project effort was the working hypothesis that long-term synaptic potentiation (LTP), a use-dependent enhancement of synaptic transmission, may mediate certain mnemonic functions of hippocampal circuitry and other forebrain structures. The project was organized around four categories of interrelated specific aims. First, new quantal analysis methods were developed and tested (Aim 2) using patch-clamp techniques to study charge fluctuations of synaptic transmission during LTP at the crayfish neuromuscular junction. Accomplishment of this aim was necessary in order to be able to transfer and apply the new method to analyze and learn the biophysical mechanisms underlying LTP in hippocampal synapses (Aim 1) a much more difficult preparation to study at this level. Learning, Memory, Synaptic plasticity, Adaptive neural networks, Long term synaptic potentiation, Simulations, Modeling. (mjm)

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DESCRIPTORS: (U) \*BRAIN, \*MAMMALS, \*NERVE CELLS, \*NEURAL NETS, \*SYNAPSES, \*MEMORY(PSYCHOLOGY), ADAPTIVE SYSTEMS, BIOPHYSICS, CIRCUITS, CRUSTACEA, DECAPODA, FUNCTIONS, HIPPOCAMPUS, HYPOTHESES, JUNCTIONS, LEARNING, METHODOLOGY, MNEMONICS, MODIFICATION, MUSCLES, NERVES, NETWORKS, NEUROPHYSIOLOGY, OPTICS, PLASTIC PROPERTIES, PREPARATION, SELF ORGANIZING SYSTEMS, SYNAPSE, TRANSMITTANCE, VARIATIONS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2312A1.

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STANFORD UNIV CA

CLEMSON UNIV S C DEPT OF PHYSICS AND ASTRONOMY

(U) Flow Control for Unsteady and Separated Flows and Turbulent Mixing.

(U) Studies of Frontal Zone Dynamics with a High-Resolution Wind Profiling System.

DESCRIPTIVE NOTE: Annual rept. 1 Oct 87-30 Sep 88,

DESCRIPTIVE NOTE: Final rept. May 85-Sep 88,

OCT 88

JAN 89

PERSONAL AUTHORS: Reynolds, W. C.; Eaton, J. K.; Powell, J. D.; Hesselink, L.; Johnston, J. P.

PERSONAL AUTHORS: Larson, M. F.

CONTRACT NO. F49620-86-K-0020

CONTRACT NO. AFOSR-85-0216

PROJECT NO. 3484

PROJECT NO. 2310

TASK NO. A1

TASK NO. A1

MONITOR: AFOSR  
TR-89-0232

MONITOR: AFOSR  
TR-89-0241

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) A coordinated set of experimental research projects on flow control is being conducted by a team with experience in fluid mechanics and automatic control. The primary objective of this work is to develop new ways to control flows of technical interest and a generic approach to the design of flow control systems. Included are studies of mixing enhancement by excitation of jets, active control of unsteady turbulent boundary layers and separated flows, and active control of the vortical flow over delta wings using leading-edge blowing. Keywords: Boundary layer control, Flow control, Turbulent mixing, Unsteady boundary layers, Separated flow, Delta wings. (EDC)

ABSTRACT: (U) Vertical velocity and reflectivity data obtained with the SOUSY-VHF-Radar located have been compared with the operational analysis data from the European Centre for Medium-range Weather Forecasting, with radiosonde data, as well as the standard synoptic weather maps for the region. Also, the effects of precipitation on VHF and UHF wind profiler data have been investigated. Results have shown that the radar reflectivities at 6 m wavelength are enhanced at the height where the frontal inversion is located. The UHF echoes are dominated by precipitation, even when the rainfall is light, while VHF echoes have nearly equal contributions from precipitation and the clear air, even when the rainfall is heavy. Comparison of the radar vertical velocities and the radiosonde data have made it possible to show the vertical circulations around several fronts. The results are in general agreement with the expected patterns of ascent in the warm air and descent in the cold sectors, but the detailed structures are more complicated and show a banded structure and a significant indirect circulation in connection with the fronts. Comparison of the operational analysis vertical velocities shows that some of the same features are reproduced in both data sets, but there are discrepancies with differences of up to half a day between the times of the appearance of the vertical velocity structures

DESCRIPTORS: (U) \*BOUNDARY LAYER CONTROL, \*DELTA WINGS, \*TURBULENT FLOW, \*UNSTEADY FLOW, AUTOMATIC, BOUNDARY LAYER, CONTROL SYSTEMS, FLOW, FLOW SEPARATION, FLUID MECHANICS, JET FLOW, LEADING EDGES, MIXING, OPTIMIZATION, TURBULENT BOUNDARY LAYER, VORTICES.

IDENTIFIERS: (U) Flow control, Active control, Blowing, PE61103D, WUAFOSR3484A1.

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connected with fronts and jet stream passages over the radar. (jhd)

DESCRIPTORS: (U) \*METEOROLOGICAL RADAR, \*RADAR REFLECTIONS, \*FRONTS(METEOROLOGY), CIRCULATION, DATA BASES, DESCENT, JET STREAMS, MAPS, METEOROLOGICAL DATA, PROFILES, RADAR, RADIOSONDES, ATMOSPHERIC MOTION, RAINFALL, REFLECTIVITY, SYNOPTIC METEOROLOGY, ULTRAHIGH FREQUENCY, WIND VELOCITY, VERTICAL ORIENTATION, VERY HIGH FREQUENCY, WEATHER, WIND.

IDENTIFIERS: (U) PE61102F, WUAFOSR2310A1.

CALIFORNIA UNIV SANTA BARBARA DEPT OF CHEMISTRY

(U) Energy Disposal in Ion-Molecule Reactions.

DESCRIPTIVE NOTE: Final rept. 15 Nov 85-14 Nov 88.

JAN 89

PERSONAL AUTHORS: Bowers, Michael T.

CONTRACT NO. AFOSR-86-0059

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-89-0233

UNCLASSIFIED REPORT

ABSTRACT: (U) Work was accomplished in three areas: A: Kinetic Energy of Products of Simple Ion Molecule Reactions, B: Generation and Reactivity of Carbon Cluster Ions, C: Photodissociation Dynamics of Simple Ion Neutral Clusters. Ion molecule reactions, Cluster formation, Reactivity, Photodissociation, Cluster ions. (mjm)

DESCRIPTORS: (U) \*CARBON, \*CLUSTERING, \*DYNAMICS, \*ION ION INTERACTIONS, \*MOLECULES, CHEMICAL REACTIONS, DISPOSAL, ENERGY, IONS, KINETIC ENERGY, NEUTRAL, PHOTODISSOCIATION, REACTIVITIES.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B1.

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COLUMBIA UNIV NEW YORK

MASSACHUSETTS INST OF TECH CAMBRIDGE CERAMICS PROCESSING RESEARCH LAB

(U) Investigation of Three-Dimensional Mesh Generation with Precise Controls.

(U) Basic Research on Processing of Ceramics for Space Structures.

DESCRIPTIVE NOTE: Final rept. 30 Sep 86-26 Sep 88.

DESCRIPTIVE NOTE: Final rept. 1 Aug 84-15 Feb 88.

JAN 89

JAN 89

PERSONAL AUTHORS: Eiseman, Peter R.

PERSONAL AUTHORS: Bowen, H. R.; Rhine, W. E.; Moffatt, W. C.; Kamiya, S.; Bishop, B. A.

CONTRACT NO. AFOSR-86-0307

CONTRACT NO. F49620-84-C-0097

PROJECT NO. 2304

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR

TR-89-0319

MONITOR: AFOSR

TR-89-0289

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) In the grant, a number of accomplishments were made in a variety of ways and in a variety of topics. The ways in which this was achieved were in oral communication with others, in the organization of conferences, in the journal publications, in the direction of graduate studies, and in the computer demonstration of theoretical developments. The topics include a study of shock-vortex interaction and a number of studies in grid generation. Those studies covered algebraic and interactive aspects here converged with the establishment of a powerful control point formulation for arbitrary grid generation. Keywords: Numerical grid generation. (kr)

DESCRIPTORS: (U) GRIDS, MESH, NUMERICAL ANALYSIS, COMPUTERS, CONTROL, CONTROL CENTERS, DEMONSTRATIONS, FORMULATIONS, ORGANIZATIONS, PERIODICALS, PRECISION, REPORTS, SYMPOSIA, THREE DIMENSIONAL, VOICE COMMUNICATIONS, INTERACTIONS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A3, Mesh generation.

AD-A 05 967

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ABSTRACT: (U) The hydrolysis of alkoxide emulsion droplets was investigated for preparing un-agglomerated, submicrometer oxide ceramic particles with a homogeneous composition. This technique was used to prepare single- and mixed-oxide powders whose overall cation composition corresponded to the initial alkoxide cation composition. Uncalcined powders were amorphous, with high surface areas and low densities; upon calcination, powders densified and became crystalline. In other studies, a water-in-oil emulsion technique was investigated for preparing SrTiO<sub>3</sub> and two AlN precursors were synthesized from dimethylaminoalane and NH<sub>3</sub>. Both AlN precursors gave fine, high purity AlN powders after heat-treatment a colloidal pressed sample densified to 95% of theoretical density at 1750 C. Ceramics, Composite ceramics, Cyclic annealing, Organosilicon polymeric binders, Polymer-coated SiC. (jes)

DESCRIPTORS: (U) ANNEALING, BINDERS, CERAMIC MATERIALS, CYCLES, DENSITY, EMULSIONS, HIGH RATE, HYDROLYSIS, LOW DENSITY, OILS, ORGANIC COMPOUNDS, POLYMERS, POWDERS, PURITY, SILICON COMPOUNDS, SURFACES, WATER.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303A3.

## UNCLASSIFIED

## OTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVI32L

AD-A205 948 20/11

AD-A205 946 20/12 9/5

STATCON INC SILVER SPRING MD

ILLINOIS UNIV AT URBANA COORDINATED SCIENCE LAB

(U) Active Control of Flexible Space Structures Using the Nitinol Shape Memory Actuators.

(U) III-V Heterojunction Structures and High Speed Devices.

DESCRIPTIVE NOTE: Final rept. 1 Feb-31 Jul 87.

DESCRIPTIVE NOTE: Final rept. 1 Jan-31 Dec 88.

OCT 87

FEB 89

PERSONAL AUTHORS: Baz, Amr M.; Iman, Karim R.; McCoy, John J.

PERSONAL AUTHORS: Morkoc, Hadis

CONTRACT NO. F49620-87-C-0035

CONTRACT NO. AFOSR-86-0111

PROJECT NO. K823

PROJECT NO. 2305

TASK NO. AL

TASK NO. C1

MONITOR: AFOSR

MONITOR: AFOSR

TR-89-0330

TR-89-0325

UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) Summarizes research progress in the feasibility demonstration of active vibration control using Nitinol shape memory actuators. Tests on straight wire and helical actuators to characterize their dynamic response are described. The experimental set-up and the range of parametric variation used in a beam vibration control are also described. Keywords: Active control, Nitinol actuators, Space structures, Vibration. (MJM)

DESCRIPTORS: (U) \*ACTUATORS, \*FLEXIBLE STRUCTURES, \*VIBRATION, CONTROL, DYNAMIC RESPONSE, HELIXES, NICKEL ALLOYS, PARAMETRIC ANALYSIS, SHAPE, TITANIUM ALLOYS, VARIATIONS, WIRE.

IDENTIFIERS: (U) PE61102F, WUAFOSRK823A1.

ABSTRACT: (U) This effort explored the new phenomena in high speed semiconductor devices and structures intended for optoelectronics. A detailed investigation of the collector breakdown properties in GaAs/AlGaAs HBT's has revealed light emission at junctions edges for the first time. The spectral features when analyzed led to the determination of electron and hole threshold energies for ionization for the first time. Additional features observed may shed light into the processing mechanisms not otherwise conveniently accessible. Other areas, e. g., modulation doped FET's, extremely low resistance nonalloyed ohmic contacts, HBT's on InP, quantum wells, optical properties of bulk AlGaAs and InGaAs were among many projects that were explored. Keywords: Heterojunction bipolar transistors; Field effect transistors; Modulation doping; Gallium arsenides. (jhd)

DESCRIPTORS: (U) \*BIPOLAR TRANSISTORS, \*ELECTROOPTICS, \*FIELD EFFECT TRANSISTORS, \*GALLIUM ARSENIDES, \*HETEROJUNCTIONS, \*SEMICONDUCTOR DEVICES, DETERMINATION, DOPING, EDGES, ELECTRIC CONTACTS, ELECTRONS, ELECTROOPTICS, EMISSION, INDIUM PHOSPHIDES, GROUP III COMPOUNDS, GROUP V COMPOUNDS, IONIZATION, LIGHT, MODULATION, OPTICAL PROPERTIES, QUANTUM ELECTRONICS, ELECTRICAL RESISTANCE, INDIUM COMPOUNDS, ARSENIDES, ALUMINUM GALLIUM ARSENIDE.

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AD-A205 939 20/4 1/1

IDENTIFIERS: (U) WUAF0SR2305C1, PE61102F.

NIELSEN ENGINEERING AND RESEARCH INC MOUNTAIN VIEW CA

(U) Exploitation of Multiple Solutions of the Navier-Stokes Equations to Achieve Radically Improved Flight.

DESCRIPTIVE NOTE: Final rept. 1 Aug 88-31 Jan 89.

FEB 89

PERSONAL AUTHORS: Nixon, David; Caruso, S. C.; Farshchi, M.

REPORT NO. NEAR-TR-398

CONTRACT NO. F49620-88-C-0097

PROJECT NO. 3005

TASK NO. A1

MONITOR: AFOSR  
TR-89-0364

UNCLASSIFIED REPORT

ABSTRACT: (U) It is known that the nonlinear Navier Stokes equations will model most fluid flow of aeronautical interest. The existence and uniqueness of the solutions to the Navier-Stokes equations have not been proven although it is known that in certain cases only the most stable solution is obtained. This present work is concerned with identifying multiple solutions of the Navier-Stokes equations for transonic flow. The objective is to exploit the existence of these solutions rather than avoid them as has been the custom in the past. The present work has shown that the cause of multiple solutions in potential flow is a bifurcation of solutions at a specific Mach number distribution; airfoils can be designed to give such a distribution. It is also found that the presence of entropy and vorticity do not affect the occurrence of phantom solutions. A physical example of a phantom solution is explained by a study of the potential phantom solutions. (jhd)

DESCRIPTORS: (U) \*TRANSONIC FLIGHT, \*NAVIER STOKES EQUATIONS, AIRFOILS, DISTRIBUTION, ENTROPY, FLUID FLOW, MACH NUMBER, NONLINEAR ALGEBRAIC EQUATIONS, POTENTIAL FLOW, SOLUTIONS(GENERAL), AERODYNAMIC STABILITY.

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TRANSONIC FLOW, VORTICES.

WEIDLINGER ASSOCIATES NEW YORK

IDENTIFIERS: (U) PE65502F, WUAFOSR3005A1, Bifurcation theory.

(U) Uncertainties in Soil Constitutive Behavior. Revision.

DESCRIPTIVE NOTE: Final rept. 1 Mar 85-30 Sep 88.

FEB 89

PERSONAL AUTHORS: Benaroya, H.

CONTRACT NO. F49620-85-C-0045

PROJECT NO. 2302

TASK NO. C1

MONITOR: AFOSR  
TR-89-0286

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Revision of rept. dated 19 Oct 88.

ABSTRACT: (U) A Markov chain phenomenological framework is used to model soil constitutive behavior accounting for uncertainties. The key in a Markov chain model is its transition probability (stochastic) matrix. Two lines of study have been pursued: 1) Explore the properties of stochastic matrices with the purpose of explaining different classes of behavior according to the mathematical properties of these transition matrices; and 2) Identify a relatively simple technique to estimate the transition probabilities from available experimental data. These were parallel efforts. The first is greatly enhanced by the success of the second. Keywords: Markov transition probability; Stochastic matrices; Convergence properties. (edc)

DESCRIPTORS: (U) SOIL MODELS, SOIL MECHANICS, CONVERGENCE, ESTIMATES, EXPERIMENTAL DATA, MARKOV PROCESSES, MATHEMATICAL MODELS, MATHEMATICS, MATRICES(MATHEMATICS), PROBABILITY, STOCHASTIC PROCESSES, TRANSITIONS.

IDENTIFIERS: (U) Constitutive behavior, Uncertainty, Transition matrices, Markov transition probability, Stochastic matrices, WUAFOSR2302C1, PE61102F.

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PRINCETON UNIV NJ DEPT OF MECHANICAL AND AEROSPACE  
ENGINEERING

CARNEGIE-MELLON UNIV PITTSBURGH PA

(U) The Structure and Control of Three-Dimensional Shock  
Wave Turbulent Boundary Layer Interactions.(U) Physical-Chemical Studies of Solutions Processing of  
Nematic Polymers.

DESCRIPTIVE NOTE: Final rept. 15 Jul 86-30 Sep 88.

DESCRIPTIVE NOTE: Final rept. 1 Sep 85-31 Aug 88.

FEB 89

FEB 89

PERSONAL AUTHORS: Bogdonoff, Seymour M.

PERSONAL AUTHORS: Berry, Guy C.

REPORT NO. MAE-1851

CONTRACT NO. F49620-85-C-0140, F49620-85-C-1040

CONTRACT NO. F49620-86-C-0094

PROJECT NO. 2307

PROJECT NO. 2303

TASK NO. A1

TASK NO. A3

MONITOR: AFOSR  
TR-89-0285MONITOR: AFOSR  
TR-89-0288

## UNCLASSIFIED REPORT

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ABSTRACT: (U) The present report briefly reviews the work accomplished on the study of three-dimensional shock wave turbulent boundary layer interactions at a Mach 3. The work consisted of two major thrusts: 1) Modeling of the complex interaction and detailed experiments coordinated with extensive computations; and 2) Exploratory studies of control concepts for a 20 deg fin and crossing shock configurations. The completed works have been reported and are briefly reviewed. A brief resume is presented of incomplete results on complex interactions, new heat transfer techniques, initial spanwise boundary layer effects, and studies in a new Low Turbulence Variable Geometry facility. Keywords: Three-dimensional shock waves; Turbulent boundary layer; Supersonic flow fields; Surface heat transfer data. (edc)

DESCRIPTORS: (U) SHOCK WAVES, TURBULENT BOUNDARY LAYER, BOUNDARY LAYER, COMPUTATIONS, CONFIGURATIONS, CONTROL THEORY, CROSSINGS, FLOW FIELDS, HEAT TRANSFER, INTERACTIONS, SHOCK, SUPERSONIC FLOW, SURFACES, THREE DIMENSIONAL, FINS.

IDENTIFIERS: (U) WJAFOSR2307A1, PE61102F.

AD-A205 923

AD-A205 921

ABSTRACT: (U) Investigations have involved solutions of the rodlike chain poly(1,4-phenylene-2,6-benzobisthiazole), PBT, and related copolymers containing a small fraction of the phenylene replaced by bipyridyl ether. Studies include: 1) The kinetics of polymerization of PBT in the nematic phase; 2) The phase equilibrium structure of PBT in solution; 3) The phase equilibria of blends of PBT and nylon in solution; 4) The rheological properties of blends of PBT and nylon in solution; and 5) The properties of fully aligned monodomains if nematic solutions of PBT. The polymerization kinetics of PBT did not show any change in rate at the isotropic to an anisotropic phase transition for the solutions studied. At higher conversions (above 90%), the polymerization rate constant decreased markedly. This is attributed to effects on the diffusion of the chains along their axes, and comparisons are made to available theoretical models. Keywords: Bisthiazoles, Thiazoles, Benzyl radical, (MJM)

DESCRIPTORS: (U) BENZYL RADICALS, COPOLYMERS, POLYMERIZATION, POLYMERS, THIAZOLES, PHENYL RADICALS, ANISOTROPY, CHAINS, CONVERSION, DIFFUSION, EQUILIBRIUM(GENERAL), KINETICS, LIQUID CRYSTALS, LIQUID PHASES, MIXTURES, MODELS, NYLON, PHASE STUDIES, PHASE TRANSFORMATIONS, PROCESSING, RATES, RHEOLOGY, SOLUTIONS(GENERAL), THEORY.

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PURDUE UNIV LAFAYETTE IN DEPT OF CHEMISTRY

IDENTIFIERS: (U) \*Thiazole/1,4-phenylene-2,6-benzo.

(U) Multiresonant Spectroscopy and Dynamics of Molecular  
Extravalent States: State-Resolved Intramolecular  
Relaxation of NO<sub>2</sub> Above 9 eV.

89

PERSONAL AUTHORS: Haber, Kenneth S.; Wiedmann, Ralph T.;  
Campos, Francis X.; Zwanziger, Josef W.; Grant, Edward R.

CONTRACT NO. F49620-87-C-0092

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-89-0313

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Chemical Physics, v129 p73-81  
1989.

ABSTRACT: (U) Multiresonant methods are described for  
the optical selection of individual vibrational states at  
energies near and above the first ionization threshold of  
NO<sub>2</sub>. These techniques are applied to resolve distinct  
Rydberg series converging to respective vertical  
ionization potentials by optical absorption from assigned  
vibration-rotation levels of the low-living sharp 3rho  
sigma<sub>g</sub><sup>2</sup> state. Spectra of levels lying between adiabatic  
and vertical thresholds show evidence for vibrational  
autoionization. This process is found to be comparatively  
slow (T>30ps) for all levels but those for which  
autoionization via a delta v = -1 transition in the  
symmetric stretch, 1, is accessible. Such rates are  
fastest for levels just above this nu = -1 threshold,  
exhibiting characteristic Fano lineshapes as broad as 11/  
cm. (MJM)

DESCRIPTORS: (U) \*IONIZATION, \*IONIZATION POTENTIALS,  
\*VIBRATION, \*NITROGEN OXIDES, \*OXIDES, ADSORPTION,  
DYNAMICS, OPTICAL PROPERTIES, SELECTION, SPECTRA,  
THRESHOLD EFFECTS, VERTICAL ORIENTATION.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B1, \*Nitrogen

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dioxide.

WISCONSIN UNIV-MILWAUKEE DEPT OF MATHEMATICAL SCIENCES

(U) Sieves, Signal Extraction, and Design.

DESCRIPTIVE NOTE: Final technical rept. 30 Sep 84-31 Aug 88.

JAN 89

PERSONAL AUTHORS: Beder, Jay H.

CONTRACT NO. AFOSR-84-0329

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR-89-0256

UNCLASSIFIED REPORT

ABSTRACT: (U) This report reviews the research completed under this grant. The areas covered include: (a) Sieve estimation for the mean and the covariance of a Gaussian process; (b) Stochastic signal extraction and a zero-one law of M. Driscoll; and (c) The problem of confounding in factorial experiments. Parts (a) and (b) have been conducted without any assumptions whatever on the 'time' parameter underlying the process. Work on part of the set of levels of each factor; in certain cases, the problem of confounding is shown to be related to the Hadamard matrix problem. Keywords: Confounding; Consistency; Factorial experiment; Gaussian process; Hadamard matrix; Reproducing kernel Hilbert space; Sieve; Simulation; Stochastic signal; Zero-one law. (jhd)

DESCRIPTORS: (U) \*STOCHASTIC PROCESSES, COMBINATORIAL ANALYSIS, EXTRACTION, HILBERT SPACE, COVARIANCE, PARAMETERS, SIGNALS, SIMULATION, TIME.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A5, Mathematical sieves, Zero-one law, Gaussian processes.

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## OTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI32L

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AD-A205 838 7/4

VANDERBILT UNIV NASHVILLE TN

PITTSBURGH UNIV PA DEPT OF CHEMISTRY

(U) Ab Initio Study of Excited States of CN- Stabilized in Point-Charge Lattices.

(U) CO Adsorption on Pt(111) Modified with Sulfur,

DEC 88

DEC 88

PERSONAL AUTHORS: Ewig, Carl W.; Tellinghuisen, Joel

PERSONAL AUTHORS: Kiskinova, M.; Szabo, A.; Yates, J. T., Jr

CONTRACT NO. AFOSR-86-0146

CONTRACT NO. AFOSR-82-0133, NSF-INT85-13805

PROJECT NO. 2303

PROJECT NO. 2303

TASK NO. 83

TASK NO. A2

MONITOR: AFOSR  
TR-89-0239MONITOR: AFOSR  
TR-89-0269

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub in Chemical Physics Letters, v153 n2-3 p160-165, 9 Dec 88.

SUPPLEMENTARY NOTE: Pub. in Jnl. of Chemical Physics, v89 n12 p7599-7608, 15 Dec 88.

ABSTRACT: (U) An MCSCF approach is used to study low lying excited electronic states of CN- and CN in vacuo and in point charge lattices. The latter simulate the electrostatic potential that renders excited states of CN- stable against autoionization in ionic lattices. The results provide strong support for a 3 sigma + assignment for the excited state involved in the UV emission spectrum of CN--in alkali halide substrates. Keywords: Cyanide anion, Ab initio computations, Excited electronic states, Point charge lattices, Reprints. (MJM)

ABSTRACT: (U) CO adsorption on clean and S-covered Pt(111) was studied using temperature programmed desorption (TPD), electron stimulated desorption ion angular distribution (ESDIAD), LEED, and work function measurements. Special attention was paid to comparing the CO adsorption rate, binding energy, and soft bending modes on a clean surface and on p(2x2) S/Pt(111) with S coverage = 0.25 S/Pt. It was found that on p(2x2) 0.25 S/Pt(111), the CO adsorption rate is decreased by a factor of 2 and only one CO adsorption state with maximum coverage, CO=0.25 CO/Pt is detected. Chemisorption, Platinum, Carbon monoxide, Sulfur, Catalyst poisons, Electron stimulated desorption, Adsorbate vibration, Chemical reactions, Reprints. (jes)

DESCRIPTORS: (U) \*CYANIDES, \*ELECTRONIC STATES, ANIONS, COMPUTATIONS, ELECTROSTATICS, EMISSION SPECTRA, IONIZATION, REPRINTS, ULTRAVIOLET SPECTRA.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2303B3.

DESCRIPTORS: (U) \*CHEMICAL REACTIONS, BENDING, CARBON MONOXIDE, CATALYSTS, CHEMISORPTION, COMPUTER PROGRAMMING, LESORPTION, ELECTRONS, NUCLEAR BINDING ENERGY, PLATINUM, POISONS, REPRINTS, STIMULATION(GENERAL), SULFUR, SURFACES, TEMPERATURE, WORK FUNCTIONS, WORK MEASUREMENT.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2303A2.

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AD-A205 836 7/2 7/4

NORTH CAROLINA UNIV AT CHAPEL HILL DEPT OF MATHEMATICS

JOHNS HOPKINS UNIV BALTIMORE MD DEPT OF CHEMISTRY

(U) Nonlinear Systems of Conservation Laws.

(U) Spin-Forbidden Radiative Decay Involving Quasidegenerate States. Application to the Beta 1 Sigma+ Yields a 3 Pi Transition in MgO,

DESCRIPTIVE NOTE: Final rept. Jul 87-Sep 88.

NOV 88

DEC 88

PERSONAL AUTHORS: Shearer, Michael

PERSONAL AUTHORS: Yarkony, David R.

CONTRACT NO. AFOSR-87-0283

CONTRACT NO. AFOSR-86-0110, NSF-CHE84-21381

PROJECT NO. 2304

PROJECT NO. 2303

TASK NO. A9

TASK NO. B3

MONITOR: AFOSR  
TR-89-0076MONITOR: AFOSR  
TR-89-0238

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) This final report covers research in the following three areas: 1) Non-strictly hyperbolic conservation laws: Change of type of equations modelling three phase flow in porous media, solution of Riemann problems; 2) Plastic flow in two dimensions: Linear stability of homogeneous deformations, justification of the quasidynamic approximation; and 3) Glimm's method for the vibrating string' discovery of exact solutions related to a periodic motion. (kr)

SUPPLEMENTARY NOTE: Pub. in Jnl. of Chemical Physics. v89 n12 p7324-7333, 15 Dec 88.

ABSTRACT: (U) In recent years the lowlying electronic states of Magnesium oxide have been the object of considerable experimental and theoretical interest. The work has centered on characterization of the nonrelativistic Born-Oppenheimer electronic sigma states and has shown that for the low-lying 1 sigma + states a multiconfiguration reference description is essential. The primary goals of this work include the determination of interstate spin orbit couplings and spin forbidden electronic transition moments necessary for the characterization of the B 1 sigma + yields a3 pi radiative transition. Reprints. (MJM)

DESCRIPTORS: (U) \*CONSERVATION, \*NONLINEAR SYSTEMS, \*PLASTIC FLOW, \*THREE PHASE FLOW, DEFORMATION, HOMOGENEITY, LINEARITY, MOTION, POROUS MATERIALS, STABILITY, VIBRATION.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A9, \*Conservation laws.

DESCRIPTORS: (U) \*ELECTRON TRANSITIONS, \*ELECTRONIC STATES, \*MAGNESIUM OXIDES, \*RADIATIVE TRANSFER, CONFIGURATIONS, COUPLINGS, MOMENTS, ORBITS, REPRINTS, SPINNING(MOTION), TRANSITIONS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B3.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EV132L

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AD-A205 834 7/6

JOHNS HOPKINS UNIV BALTIMORE MD DEPT OF CHEMISTRY

GORDON RESEARCH CONFERENCES INC KINGSTON RI

(U) On the Electronic Structure of the He + H<sub>2</sub> System: Characterization of  $\sigma$  and Nonadiabatic Interactions between the 1 1A' and 2 1A' Potential Energy Surfaces.

(U) Report to the Air Force Office of Scientific Research on Grant Number AFOSR-88-0108 for the Partial Support of the 1988 Gordon Conference on Polymers (West).

OCT 88

DESCRIPTIVE NOTE: Final rept. Jan-Jun 88.

PERSONAL AUTHORS: Perry, Jason K.; Yarkony, David R.

JAN 89

CONTRACT NO. AFOSR-86-0110

PERSONAL AUTHORS: Cruickshank, Alexander M.

PROJECT NO. 2303

CONTRACT NO. AFOSR-88-0108

TASK NO. 83

PROJECT NO. 2303

MONITOR: AFOSR  
TR-89-0237

TASK NO. A3

MONITOR: AFOSR  
TR-89-0261

UNCLASSIFIED REPORT

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SUPPLEMENTARY NOTE: Pub. in Jnl. of Chemical Physics, v89 n8 p4945-4953, 15 Oct 88.

ABSTRACT: (U) The reactions of atoms with diatomic molecules in which one of the reactants is electronically excited have long provided fertile ground for the study of electronically non-adiabatic chemistry. Studies in these areas have been characterized by the close interplay of theory and experiment. The helium-hydrogen system will be considered in this work. As a four electron, three atom system, it is a prime candidate for theoretical studies. While reactions each represent electronic quenching there is an important distinction. Keywords: Reprints, Hydrogen, Helium. (mjm)

DESCRIPTORS: (U) \*DIATOMIC MOLECULES, \*ELECTRONS, \*HELIUM, \*HYDROGEN, ATOMS, ELECTRONICS, INTERACTIONS, QUENCHING, REACTANTS(CHEMISTRY), REPRINTS, THEORY.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B3.

ABSTRACT: (U) The technical program of the 1988 Gordon Conference on Polymers (West) came together exactly as outlined in the proposal requesting support. The final program as it occurred is appended. There were sixteen speakers: Seven from the U.S. three from Israel, two from West Germany, and one each from Australia, Canada, Japan and the United Kingdom. While this Gordon Conference has a charter to cover the entire area of polymers, from chemical synthesis to solid-state properties, that is naturally a difficult goal to achieve. The guiding principal in the organization of this particular conference was that this broad coverage could be best achieved if there were a unifying sub-theme running through these different areas. The main sub-theme for this conference was surfaces, interfaces and microstructured polymers. Polymers, Surfaces. (jes)

DESCRIPTORS: (U) \*POLYMERS, AUSTRALIA, CANADA, GREAT BRITAIN, ISRAEL, JAPAN, SOLID STATE ELECTRONICS, SYNTHESIS(CHEMISTRY), WEST GERMANY

IDENTIFIERS: (U) PE61102F, WUAFOSR2303A3.

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## FLORIDA UNIV GAINESVILLE QUANTUM THEORY PROJECT

CORNELL UNIV ITHACA NY LAB OF ATOMIC AND SOLID STATE PHYSICS

(U) Theory and Implementation of the MBPT Density Matrix.  
An Application to One-Electron to One-Electron Properties.

JUN 88

DEC 88

PERSONAL AUTHORS: Trucks, Gary W.; Salter, E. A.; Sosa, Carlos; Bartlett, Rodney J.

PERSONAL AUTHORS: McEachern, R. L.; Adler, D. L.; Goodstein, D. M.; Kimmel, G. A.; Litt, B. R.

CONTRACT NO. AFOSR-88-0041

CONTRACT NO. AFOSR-88-0069

PROJECT NO. 2301

PROJECT NO. 2303

TASK NO. A4

TASK NO. A2

MONITOR: AFOSR  
TR-88-1317

MONITOR: AFOSR  
TR-89-0240

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Chemical Physics Letters, v147 n4 p359-366 10 Jun 88.

SUPPLEMENTARY NOTE: Pub. in Review of Scientific Instruments, v59 n12 p2526-2567 Dec 88.

ABSTRACT: (U) To circumvent the problem of spin contamination in unrestricted Hartree Fock based coupled cluster (CC) calculations. A new method is presented for calculations for certain classes of open-shell systems. The approach ensures that the proper spin component of the resulting correlated wave function is projected out in the energy evaluation by the use of a reference function constructed from suitably chosen restricted open-shell Hartree-Fock or other orbitals. This single-reference open-shell spin-restricted CC method is applied to the calculation of ionization potentials in the N<sub>2</sub> molecule, and it is shown that highly accurate results can be obtained in a 5s4p1d basis. The mean error for all the principal ionization potentials of N<sub>2</sub> compared to experiment is 0.45%. Reprints. (jhd)

DESCRIPTORS: (U) \*MOLECULAR ENERGY LEVELS, \*SPIN STATES, \*MOLECULAR ORBITALS, ACCURACY, CONTAMINATION, CLUSTERING, IONIZATION POTENTIALS, HARTREE FOCK APPROXIMATION, REPRINTS, TEST AND EVALUATION, WAVE FUNCTIONS.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2301A4, Couple clusters.

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ABSTRACT: (U) An apparatus is designed and constructed to combines hyperthermal energy ion scattering (<100eV) with low-energy ion scattering (a few hundred eV to several keV). The UHV scattering chamber possesses a full range of sample preparation and characterization capabilities, including LEED, Auger spectroscopy, a Kelvin probe for work function measurements, and facilities for gas or alkali-metal deposition. The differentially pumped beamline provides well-collimated, monoenergetic beams of gas or alkali-metal ions ranging in energy from <10keV. To illustrate the qualitative changes in the scattering behavior observed over this range, experimental results are presented for Na<sup>+</sup> scattered off the Cu (110) surface with the incident ion energy ranging from 56eV to 4keV. A comparison is shown between 1 keV K<sup>+</sup> and 1 keV Ar<sup>+</sup> scattered from the same surface. Keywords: Hyperthermal energy ion beams; Ion beam optics; Electrostatic Analyzer. Reprints. (jhd)

DESCRIPTORS: (U) \*ELECTROSTATIC ANALYZERS, \*ION BEAMS, \*SCATTERING, ALKALI METALS, AUGER ELECTRON SPECTROSCOPY, ELECTRON DIFFRACTION, CHAMBERS, DEPOSITION, ENERGY, HIGH TEMPERATURE, IONS, LOW ENERGY, OPTICS, REPRINTS, WORK

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FUNCTIONS. WORK MEASUREMENT.

BDM CORP MCLEAN VA

IDENTIFIERS: (U) PEG1102F, WUAFO5R2303A2.

(U) A New Perspective on Rutting in Flexible Pavements.

DESCRIPTIVE NOTE: Final rept.,

FEB 89

PERSONAL AUTHORS: Harrop-Williams, K. O.

REPORT NO. BDM/MCL-89-0108-TR

CONTRACT NO. F49620-88-C-0019

PROJECT NO. 2302

TASK NO. C1

MONITOR: AFOSR  
TR-89-0326

UNCLASSIFIED REPORT

ABSTRACT: (U) This report represents a new approach to the prediction of rutting in flexible pavements. It recognizes the prominent role played by the granular layer in the stress distribution and strain accumulation in flexible pavements and diverts from the conventional continuum approach to modeling stresses in the layer. Fundamentally, the conventional requirement for the existence of the second derivatives of strains in the granular layer is replaced by a stress continuity equation that provides for stress transfer between particles through these contacts. This is developed assuming that deformation is due primarily to particle movements and is shown to be based on a nonlinear stress-strain relationship unique for granular material. In order to evaluate the rutting in a flexible pavement, the particulate theory of stress transfer is extended to predict stresses in multilayered systems consisting of granular and elastic layers. Knowledge of the nature of stress transfer and stress-strain response is next incorporated into a theory for strain accumulation with repetitive loading. (sdw)

DESCRIPTORS: (U) \*FLEXIBLE MATERIALS, \*PAVEMENTS, \*STRESS STRAIN RELATIONS, CONTINUITY, DEFORMATION, DISTRIBUTION, EQUATIONS, GRANULES, LAYERS, MODELS,

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NONLINEAR SYSTEMS, PARTICLES, PARTICULATES, REQUIREMENTS,  
RESPONSE, STRESSES, THEORY, TRANSFER.

YALE UNIV NEW HAVEN CONN

(U) Internal Energy Distribution of OCS Desorbing from a  
Hot Platinum Surface.

IDENTIFIERS: (U) WUAFOSR2302C1, PE61102F.

88

PERSONAL AUTHORS: Groeger, Wolfgang; Fenn, John B.

CONTRACT NO. AFOSR-87-0323

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-89-0291

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Physical Chemistry.  
v93 n1 p344-349 1988.

ABSTRACT: (U) Rotational and vibrational energy distributions in OCS molecules desorbed from a hot platinum surface have been characterized by Fourier transform infrared spectrometry (FTIS) of radiation at 2062/cm from molecules that are vibrationally excited in the nu1 stretch mode. Measurements were performed at surface temperatures from 670 to 1270 K. The extent of equilibrium with the platinum surface was incomplete for rotation and bending vibration, but the nu1 stretch mode seemed to be completely accommodated. For surface temperatures above 900 K the lower rotational levels were somewhat overpopulated relative to the Boltzman distribution that characterized the higher levels. Computer simulations could be best-fit to the measured spectra when mode-specific temperature values were taken as T sub R = 0.65 T sub s, T sub nu1 = and T sub nu2 = 0.45 T sub s. Experimental data were insufficient to specify T sub nu3, but the computer simulations showed that at achievable resolution the spectral features were insensitive to its value. Carbonyl sulfide; Reprints. (jhd)

DESCRIPTORS: (U) 'CARBONYL COMPOUNDS, \*DESORPTION, 'PLATINUM, 'SULFIDES, 'SURFACE CHEMISTRY, BENDING, COMPUTERIZED SIMULATION, DISTRIBUTION, ENERGY.

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EXPERIMENTAL DATA, FOURIER TRANSFORMATION, HIGH TEMPERATURE, INFRARED SPECTROSCOPY, INTERNAL, LOW LEVEL, REPRINTS, MOLECULAR ROTATION, SURFACE TEMPERATURE, MOLECULAR VIBRATION.

YALE UNIV NEW HAVEN CONN

(U) Microjet Burners for Molecular-Beam Sources and Combustion Studies.

IDENTIFIERS: (U) WUAFOSR2308B1, PEG1102F, \*Carbonyl sulfide, Carbon oxysulfide.

SEP 88

PERSONAL AUTHORS: Groeger, Wolfgang; Fenn, John B.

CONTRACT NO. AFOSR-87-0323

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-89-0290

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Review of Scientific Instruments, v59 n9 p1971-1979 Sep 88.

ABSTRACT: (U) A novel microjet burner is described in which combustion is stabilized by a hot wall. The scale is so small that the entire burner flow can be passed through a nozzle only 0.2 mm or less in diameter into an evacuated chamber to form a supersonic free jet with expansion so rapid that all collisional processes in the jet gas are frozen in a microsecond or less. This burner can be used to provide high-temperature source gas for free jet expansion to produce intense beams of internally hot molecules. A more immediate use would seem to be in the analysis of combustion products and perhaps intermediates by various kinds of spectroscopies without some of the perturbation effects encountered in probe sampling of flames and other types of combustion devices. As an example of the latter application of this new tool, we present infrared emission spectra for jet gas obtained from the combustion of oxygen-hydrocarbon mixtures both fuel-lean operation. Reprints. (jes)

DESCRIPTORS: (U) \*BURNERS, \*COMBUSTION, \*JET FLOW, COLLISIONS, COMBUSTION PRODUCTS, EXPANSION, STABILIZATION, EMISSION SPECTRA, FLAMES, SUPERSONIC FLOW, JET ENGINE FUELS, MIXTURES, GASES, HIGH TEMPERATURE, INFRARED SPECTRA, INTERNAL, NOZZLE GAS FLOW, MOLECULAR SPECTROSCOPY, MOLECULAR BEAMS, MOLECULES, OPERATION.

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REPRINTS, SOURCES, WALLS

AEROCHEM RESEARCH LABS INC PRINCETON NJ

IDENTIFIERS: (U) Microjet burners, WJAFOSR2303B1,  
PE61102F.

(U) Ion-Molecule Reactions in Sooting Acetylene-Oxygen  
Flames,

88

PERSONAL AUTHORS: Calcote, H. F.; Keil, D. G.

REPORT NO. AEROCHEM-TP-454-B

CONTRACT NO. F49620-83-C-0150

PROJECT NO. 2308

TASK NO. A2

MONITOR: AFOSR  
TR-89-0292

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Combustion and Flame, v74  
p131-146 1988.

ABSTRACT: (U) Ion concentration profiles up to mass 557 amu were measured in a sooting acetylene-oxygen flame at an equivalence ratio of 3.0, a total pressure of 2.67 kPa, and an unburned gas velocity of 50 cm per second. The mass spectrometer was calibrated for mass by seeding flames with isotopes of several metals and by using deuterated acetylene, which also allowed us to measure the number of hydrogen atoms in each hydrocarbon ion. The ion concentration sensitivity of the mass spectrometer was calibrated by comparing the individual ion currents with the ion current obtained in operation as a high-pass mass filter (that is, transmitting only those ions whose masses were greater than a specific mass) and by relating these currents to the total ion concentrations determined using a Langmuir probe. Ion-molecule reactions, including those with large ions, were demonstrated to be rapid under these flame conditions. Keywords: Ion-molecule reaction, Mechanisms of soot formation, Combustion, Premixed flames, Reprints. (JES)

DESCRIPTORS: (U) \*ACETYLENE, \*COMBUSTION, ATOMS,  
CHEMICAL REACTIONS, FLAMES, GASES, HIGH PASS FILTERS,  
HYDROCARBONS, HYDROGEN, ION DENSITY, IONIC CURRENT, IONS.

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ISOTOPES, LANGMUIR PROBES, MASS, MASS SPECTROMETERS,  
METALS, MIXING, MOLECULES, OXYGEN, PROFILES, REPRINTS,  
RESPONSE, SEEDING, SENSITIVITY, SOOT, VELOCITY.

STANFORD UNIV CA DEPT OF MECHANICAL ENGINEERING

(U) Bifurcating Jets at High Reynolds Numbers.

IDENTIFIERS: (U) WUAFOSR2308A2, PEG1102F.

DESCRIPTIVE NOTE: Technical rept.

DEC 88

PERSONAL AUTHORS: Parekh, D. E.; Leonard, A.; Reynolds, W.  
C.

REPORT NO. TF-35

CONTRACT NO. F49620-84-K-0005, F49620-86-K-0020

PROJECT NO. 3484

TASK NO. A1

MONITOR: AFOSR  
TR-89-0282

UNCLASSIFIED REPORT

ABSTRACT: (U) There is much interest in the use of controlled excitations to manage various types of flows. This work focuses on use of dual-mode forcing to alter dramatically the structure of round turbulent jets. Properly-combined axial and helical excitations can cause a round jet to split into two distinct jets. This Y-shaped jet, known as a bifurcating jet, exhibits spreading angles as high as 80 deg. Vortex rings are formed at the jet exit and propagate along the two branches of the jet. A vortex-filament code was developed for simulating the large-scale features of bifurcating jets. The motion and interaction of the vortex structures in this flow are tracked in a three-dimensional, Lagrangian coordinate system. This simulation showed that inviscid vortex interactions cause the dramatic changes in jet development and that spreading angle increases with axial Strouhal number. The experimental apparatus consists of an acoustically-excited, 2-cm-diameter air jet. The jet evolution is documented by flow visualization at velocities up to 75 m/s. Reynolds numbers up to 100,000, and Mach numbers up to 0.22. Instantaneous and phase-average cross-sections of the jet reveal the effects of forcing amplitude on the structure and spreading angle of axially-excited, helically-excited,

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and bifurcating jets. The primary conclusions of this experiment are that: 1) Dual-mode acoustic excitation can produce bifurcation in air jets at high Reynolds numbers and that the jet spreading angle increases with both excitation amplitudes; and 2) The excitation amplitude required to produce bifurcation increases with Reynolds number, but the corresponding excitation Strouhal number is invariant (EDC)

DESCRIPTORS: (U) \*EXCITATION, \*JET FLOW, \*VORTICES, ACOUSTIC WAVES, AIR FLOW, AMPLITUDE, ANGLES, AXIAL FLOW, COORDINATES, CROSS SECTIONS, DUAL MODE, FLOW VISUALIZATION, HELICES, HIGH RATE, INTERACTIONS, INVISCID FLOW, LAGRANGIAN FUNCTIONS, MACH NUMBER, MOTION, REYNOLDS NUMBER, RINGS, COMPUTERIZED SIMULATION, STRUCTURAL PROPERTIES, SPLITTING, THREE DIMENSIONAL, TURBULENT FLOW, VELOCITY.

IDENTIFIERS: (U) Flow control, Bifurcating jets, Spreading angles, Strouhal number, Acoustic excitation, Forcing amplitude, Controlled excitation, PE61103D, WUAFOSR3484A1.

MICHIGAN UNIV ANN ARBOR DEPT OF NUCLEAR ENGINEERING  
(U) Population Inversions in Ablation Plasmas Generated by Intense Electron Beams.

DESCRIPTIVE NOTE: Final rept. 1 Nov 85-31 Oct 88.

NOV 88

PERSONAL AUTHORS: Gilgenbach, R. M.; Kammash, T.; Brake, M. L.

CONTRACT NO. AFOSR-86-0012

PROJECT NO. 2301

TASK NO. A8

MONITOR: AFOSR  
TR-89-0294

UNCLASSIFIED REPORT

ABSTRACT: (U) Experiments during the past three years have concerned the generation and spectroscopic study of electron beam-driven carbon plasmas in order to explore the production of optical and ultraviolet radiation from nonequilibrium populations. The output of MELBA (Michigan Electron Long Beam Accelerator), has been connected to an electron beam diode consisting of an aluminum (or brass) cathode stalk and a carbon anode. Magnetic field coils have been designed, procured, and utilized to focus the electron beam. A side viewing port permitted spectroscopic diagnostics to view across the surface of the anode. Spectroscopic diagnosis has been performed using a 1 m spectrograph capable of operation from the vacuum ultraviolet through the visible. This spectrograph is coupled to a 1024 channel optical multichannel analyzer. Spectra taken during the initial 400 ns period of the e-beam pulse showed a low effective charge plasma with primarily molecular components (C<sub>2</sub>, CH) as well as atomic hydrogen and singly ionized carbon (CII). When the generator pulse was crowbarred after the first 400 ns, the spectra revealed a continuation of the low charge state plasma. At times greater than 400 ns in non-crowbarred shots, the spectra revealed a highly ionized plasma with a very large intensity line at 2530 Angstroms due to CIV (5g-4f), and lower intensity lines due to CIII

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and CII. This CIV line emission increased with time, peaking sharply between 750 ns and 900 ns, and decayed rapidly in less than 100 ns. Emission from these high ionization states may be due to electron beam-plasma instabilities, as this emission was accompanied by high levels of radio frequency and microwave emission. (jhd)

DESCRIPTORS: (U) \*ABLATION, \*CARBON, \*EMISSION SPECTRA, \*PUMPING(ELECTRONICS), \*PLASMAS(PHYSICS), \*VACUUM ULTRAVIOLET RADIATION, \*ELECTRON IMPACT SPECTRA, ALUMINUM, ANODES, ATOMIC STRUCTURE, BRASS, DIAGNOSIS(GENERAL), DIODES, ELECTRON BEAMS, EMISSION, HYDROGEN, INTENSITY, INVERSION, IONIZATION, LINE SPECTRA, MAGNET COILS, MAGNETIC FIELDS, MICROWAVES, POPULATION, PRODUCTION, PULSES, RADIOFREQUENCY, SIDES, SPECTROSCOPY, SURFACES, ULTRAVIOLET RADIATION, VIEWERS.

IDENTIFIERS: (U) PE61102F, WUAF0SR2301A8, Multichannel analyzers, Population inversions

TEXAS A AND M UNIV COLLEGE STATION DEPT OF AEROSPACE ENGINEERING

(U) Ultrasonic Nondestructive Evaluation of Damage in Continuous Fiber Composites.

DESCRIPTIVE NOTE: Final rept. 1 Feb 84-31 Jan 87.

NOV 87

PERSONAL AUTHORS: Kinra, Vikram K

CONTRACT NO. AFOSR-84-0066

PROJECT NO. 2302

TASK NO. 82

MONITOR: AFO  
TR 0315

UNCLASSIFIED REPORT

ABSTRACT: (U) It is well-known that composite materials develop a complex damage state when they are subjected to monotonic or fatigue loading. The damage has, in general, two effects on the propagation of an ultrasonic wave: it decreases the stiffness and increases the attenuation. The central objective of this work has been to correlate damage states with changes in the two ultrasonic parameters (wavespeed and attenuation). We have developed a new technique for measuring the wavespeed and attenuation in the thickness direction, in extremely thin laminates. We have also developed a technique for the excitation and detection of Lamb waves in the lengthwise direction. Thus, both the in-plane and out-of-plane measurements can be made. Composites, Velocity, Damage, Attenuation, Ultrasonic nondestructive evaluation. (jes)

DESCRIPTORS: (U) \*COMPOSITE MATERIALS, \*FIBER REINFORCED COMPOSITES, \*NONDESTRUCTIVE TESTING, ATTENUATION, DAMAGE, LAMINATES, MEASUREMENT, PARAMETERS, STIFFNESS, THICKNESS, THINNESS, ULTRASONIC TESTS, ULTRASONICS, WAVES.

IDENTIFIERS: (U) WUAF0SR2302B2, PE61102F.

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EASTERN MONTANA COLL BILLINGS DEPT OF PHYSICAL SCIENCES

(U) Study of the Infrared Celestial Background.

DESCRIPTIVE NOTE: Final rept. 1 Feb 85-31 Jan 88.

SEP 88 67P

PERSONAL AUTHORS: Bentley, Alan F.

CONTRACT NO. AFOSR-85-0139

PROJECT NO. 2311

TASK NO. A1

MONITOR: AFOSR  
TR-89-0318

UNCLASSIFIED REPORT

ABSTRACT: (U) The following revised objectives were formulated: to determine the nature of infrared sources observed; to carry out theoretical investigations on the nature and evolution of selected infrared sources; and to establish the statistical distribution of infra-sources in space to a sensitivity limit and spatial resolution consistent with available observing equipment and techniques. The research objectives follow: Research on infrared sources in the W40 complex was published. Results of radio and infrared observations of OH/IR stars in the Galaxy were published. A theoretical study of the possibilities for observation of galaxies in the process of formation in the early universe was published in the Proceedings of the Montana Academy of Science. The results of a series of observations made on Nova Vulpeculae 1984 2 were published. Preliminary results on our studies of the infrared properties of the nuclei of planetary nebulae were presented. A theoretical model has been constructed for transfer of cosmic ray energy to emission nebulae. (jhd)

DESCRIPTORS: (U) 'BACKGROUND RADIATION', 'EXTRATERRESTRIAL RADIATION', 'INFRARED RADIATION', 'ASTRONOMY', 'ASTRONOMICAL GEODESICS', 'COSMIC RAYS', 'EMISSION', 'ENERGY', 'GALAXIES', 'LIMITATIONS', 'NEBULAE', 'NUCLEI', 'OBSERVATION', 'RESOLUTION', 'SENSITIVITY', 'SOURCES', 'SPATIAL DISTRIBUTION', 'STARS'.

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JET PROPULSION LAB PASADENA CA

(U) MPD Thruster Erosion Research.

DESCRIPTIVE NOTE: Final rept. 1 Jan 31 Dec 87.

NOV 88

PERSONAL AUTHORS: King, David Q.; Callas, John L.

REPORT NO. JPL-D-6020

CONTRACT NO. AFOSR-ISSA-87-0046, NAS7-918

PROJECT NO. 2308

TASK NO. A1

MONITOR: AFOSR  
TR-89-0331

UNCLASSIFIED REPORT

ABSTRACT: (U) The multimegawatt MPD (Magnetoplasma Dynamic) thruster is an electric engine capable of orbital transfer and maneuvering of large payloads driven by a megawatt class space power supply. The MPD thruster is capable of specific impulses from 1,500 to 8,000 s. The high specific impulse means this system can perform missions using much less propellant than chemical systems. A five MW MPD electric system, propellant and payload from one shuttle launch must be replaced by the equivalent of four fully loaded Centaur G' stages. Thus, the savings in propellant and launch costs are very substantial. This report discusses 3 aspects of MPD thruster Physics: 1) A significant operational problem which is limited the useful operation of the device is discussed. This is severe erosion of the insulator at the cathode insulator junction. A technique which appears to solve the problem has been tested, and is described. 2) A preliminary analyses of anode sheath is presented. 3) Analysis of the discharges two dimensional nature is explored for the case where transverse gradients are considered but transverse velocity is assumed to be zero. This situation applies to high aspect ratio devices. The analyses concludes with: a) a formalish that provides a means to qualitatively evaluate Ohmic dissipation from simple measurements of magnetic Hall effect on

magnetosonic choking (where thermodynamics is ignored).  
Keywords: Cathode lifetime. (EDC)

DESCRIPTORS: (U) \*ELECTRIC ENGINES, \*THRUSTERS, ANODES, ASPECT RATIO, CATHODES, COSTS, COST EFFECTIVENESS, DISSIPATION, ELECTRICAL EQUIPMENT, EROSION, GRADIENTS, HALL EFFECT, HIGH RATE, INTENSITY, LAUNCHING, LIFE EXPECTANCY(SERVICE LIFE), MAGNETIC FIELDS, MANEUVERABILITY, MEASUREMENT, ORBITS, PAYLOAD, PHYSICS, PLASMAS(PHYSICS), POWER SUPPLIES, SPACE SHUTTLES, SPACE SYSTEMS, SPECIFIC IMPULSE, TRANSFER, TRANSVERSE, TWO DIMENSIONAL, VELOCITY.

IDENTIFIERS: (U) MPD thrusters, Magnetoplasmdynamics, Anode sheaths, Ohmic dissipation, Magnetosonic choking, PEG1102F, WUAFOSR2308A1.

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ILLINOIS UNIV AT THE MEDICAL CENTER CHICAGO COLL OF  
MEDICINE

STIMULATION(PHYSIOLOGY), STIMULI, DIAZEPAM.

(U) Role of Adenosine Analogs and Growth Hormone in Waking  
and Sleep.

IDENTIFIERS: (U) PE61102F, WUAFOSR2312A2, Awake, Sleep  
wake cycles.

DESCRIPTIVE NOTE: Final technical rept. 15 Sep 85-15 Sep  
88.

FEB 89

PERSONAL AUTHORS: Radulovacki, Miodrag

CONTRACT NO. AFOSR-85-0349

PROJECT NO. 2312

TASK NO. A2

MONITOR: AFOSR  
TR 89-0362

UNCLASSIFIED REPORT

ABSTRACT: (U) We have tried to establish the mechanism of hypnotic action of adenosine by pursuing several lines of investigation. First, we have found that when rats are deprived of rapid-eye-movement sleep (REMS) there is an increase in adenosine A1 receptors in two brain structures, the cerebral cortex and the corpus striatum. At the same time there was no change in brain adenosine concentration. Secondly, we have tested the hypothesis that hypnotic action of benzodiazepines, which block the transport of adenosine stimulation of adenosine receptors. We found that chronic administration of diazepam stimulated adenosine receptors. We found that chronic administration of diazepam stimulated adenosine receptors which was evident by a decreased number of A1 receptors in the hippocampus and A2 receptors in the striatum. Finally, we studied the effects on sleep in rats of various types of adenosine receptor stimulants and blockers and obtained results that were in accordance with our previous reports. (AW)

DESCRIPTORS: (U) ADENOSINE, GROWTH SUBSTANCES, HORMONES, HYPNOTICS AND SEDATIVES, SLEEP, ANALOGS, BRAIN, CEREBRAL CORTEX, CONCENTRATION(CHEMISTRY), HIPPOCAMPUS, HYPOTHESES, RATS, SENSE ORGANS.

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NEW ORLEANS UNIV LA DEPT OF CHEMISTRY

(U) Computational Determination of the Structures and Some Properties of Tetrahedrane, Prismane, and Some of Their Aza Analogues.

regions near the nitrogens, suggesting significant basicity. Strained molecules, Tetrahedrane, Electrostatic potentials, Ab initio, self consistent field computations, Bond strain, Reprints. (mjm)

DESCRIPTIVE NOTE: Journal article.

DESCRIPTORS: (U) \*BONDING, \*ELECTROSTATIC CHARGE, \*NITROGEN, \*HYDROCARBONS, ATTACK, COMPUTATIONS, CONSISTENCY, DETERMINATION, ELECTROSTATICS, INDEXES, INDICATORS, MOLECULES, REGIONS, REPRINTS, RUPTURE, STRUCTURES.

89

PERSONAL AUTHORS: Politzer, Peter; Seminario, Jorge M.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2303B3, \*Tetrahedrane, \*Prismane.

CONTRACT NO. AFOSR-88-0068

PROJECT NO. 2303

TASK NO. B3

MONITOR: AFOSR  
TR-89-0371

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Physical Chemistry, v93 n2 p588-592 1989.

ABSTRACT: (U) We have carried out an ab initio self consistent field computational study of tetrahedrane, prismane, and nine of their aza analogues, in which C-H units have been replaced by nitrogens structures optimized at the 3-21G level were used to compute molecular electrostatic potential as guides to reactive behavior, and bond deviation indexes as quantitative indicators of bond strain. Within each set of azaprismane isomers, the most stable is the one having the fewest N-N bonds. The exceptional length of these bonds, approximately 1.59 Å, may reflect a tendency to rupture. In the tetrahedranes, the bonds are quite highly strained but become less so as the number of nitrogens increases. The degrees of bond strain are not as great in the prismanes and do not necessarily diminish as more nitrogens are introduced. There are negative electrostatic potentials associated with the C-C bonds in tetrahedrane and prismane, indicating that these bonds can serve as initial sites for electrophilic attack. These potentials are greatly weakened or eliminated by the introduction of nitrogens. In the azatetrahedranes and azaprismane, there are strong and extensive negative

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MASSACHUSETTS INST OF TECH CAMBRIDGE DEPT OF MATHEMATICS

DESCRIPTORS: (U) ALGORITHMS, CONFORMAL MAPPING, LINEAR ALGEBRA, NUMERICAL ANALYSIS, CIRCULAR DISTORTION, EFFICIENCY, EIGENVALUES, PAPER, POLYGONS, REGIONS, SOLUTIONS(GENERAL), SPECTRA, STATISTICS.

(U) Numerical Conformal Mapping and Applications

DESCRIPTIVE NOTE: Annual rept 1 Dec 87-30 Nov 88.

IDENTIFIERS: (U) PE61102F, WUAF05R2304A3.

JAN 89

PERSONAL AUTHORS: Trefethen, Lloyd N.

CONTRACT NO AFOSR 87-0102

PROJECT NO 2304

TASK NO. A3

MONITOR AFOSR TR 89-0350

UNCLASSIFIED REPORT

ABSTRACT: (U) Progress was made in three principal areas:

- (1) Conformal mapping of highly elongated polygons. Conventional methods of conformal mapping break down when applied to highly distorted regions, as arise frequently in applications. In the first year of research under this grant, Prof. Trefethen and Louis Howell developed a modified Schwarz Christoffel formula to handle highly elongated polygons. In the second year this work was completed and written up for publication in the SIAM Journal on Scientific and Statistical Computing; (2) Conformal mapping of circular polygons. Work by Trefethen and Howell is underway on the problem of extending Schwarz Christoffel methods to the mapping of 'circular polygons' bounded by straight sides and circular arcs; (3) Applications in numerical linear algebra. The efficient solution of large nonsymmetric linear algebra problems Ax = b is an important but incompletely understood area of numerical analysis. Because the eigenvalues of A are generally complex, some algorithms for this problem are based on conformal mapping, complex approximation, and other techniques of complex analysis. One particular algorithm combining both conformal mapping and complex approximation is discussed in a new paper by Trefethen, and this has led to an investigation in greater generality of the behavior of non-normal matrices with complex spectra. (FR)

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YALE UNIV NEW HAVEN CT DEPT OF ELECTRICAL ENGINEERING

JOHNS HOPKINS UNIV BALTIMORE MD

(U) Development and Analysis of Arma Parameter Estimation Schemes in the Presence of Noise.

(U) Collaborative Experimental and Theoretical Study of the Photodissociation and Reactions of the Azide Radical.

DESCRIPTIVE NOTE: Annual rept. 1 Nov 87-1 Nov 88.

DESCRIPTIVE NOTE: Interim rept 1 Feb 88-31 Jan 89.

JAN 89

FEB 88

PERSONAL AUTHORS: Nehorai, Irye

PERSONAL AUTHORS: Dagdigan, Paul J.; Alexander, Millard H.

CONTRACT NO. AFOSR 88-0080

PROJECT NO. 2304

CONTRACT NO. F49620-88-C-0056

TASK NO. A6

PROJECT NO. 2303

MONITOR: AFOSR TR-89-0329

TASK NO. B1

MONITOR: AFOSR

TR-89-0320

UNCLASSIFIED REPORT

ABSTRACT: (U) The original proposal focussed on the development and analysis of single-sensor parameter estimation schemes for ARMA (Autoregressive Moving Average) signals in noise. In the single sensor problem, we solved several new problems for these signals and also added sine wave signals in noise. Furthermore, we extended the research to multi-sensor (or sensor array) estimation algorithms which are useful for direction-of-arrivals estimation. All the proposed algorithms have been tested by computer simulation to verify their operation. Topics include: Single sensor algorithms; performance analysis of algorithms; Sensor array processing. Keywords: Signal processing; Transfer functions (cdc)

DESCRIPTORS: (U) 'PARAMETRIC ANALYSIS, 'SIGNAL PROCESSING, ALGORITHMS, ARRAYS, ARRIVAL, COMPUTERIZED SIMULATION, DATA PROCESSING, DETECTORS, DIRECTIONAL, ESTIMATES, MULTISENSORS, NOISE, PARAMETERS, PERFORMANCE TESTS, REGRESSION ANALYSIS, SIGNALS, SINE WAVES, TRANSFER FUNCTIONS.

IDENTIFIERS: (U) ARMA(Autoregressive Moving Average), Signals in noise, Direction of arrival, PE61102F, WJAFOSR2304A6

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ABSTRACT: (U) A theoretical investigation of the energetics of the dissociation of ground state hydrazoic acid HN3 and the azide radical N3 has been carried out through complete active space SCF and multi-reference configuration interaction calculations with large basis sets. Of particular interest was (a) The determination of the bond dissociation energies of HN3 and N3, (b) The location of the geometry and topology of the transition state for spin-forbidden decomposition and the corresponding activation energy, and (c) The investigation of the magnitude and origin of exit channel barriers in the spin-allowed decomposition pathway. Keywords: Hydrazoic acid, Azide radical, Photodissociation, Electronic quenching, Chemical reaction. (mjim)

DESCRIPTORS: (U) 'AZIDES, 'CHEMICAL DISSOCIATION, 'CHEMICAL REACTIONS, 'HYDRAZOIC ACID, 'PHOTODISSOCIATION, ACTIVATION ENERGY, BARRIERS, CHANNELS, CHEMICAL BONDS, DISSOCIATION, ELECTRONICS, ENERGETIC PROPERTIES, ENERGY, EXITS, QUENCHING, THEORY, TOPOLOGY, TRANSITIONS.

IDENTIFIERS: (U) PE61102F, WJAFOSR2303C1.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI32L

AD A205 593 17/9 4/1

AD-A205 592 4/1

UTAH STATE UNIV LOGAN CENTER FOR ATMOSPHERIC AND SPACE SCIENCES

ALASKA UNIV FAIRBANKS GEOPHYSICAL INST

(U) Mesospheric Wind Measurement

(U) Gravity Wave and Turbulence Studies Using a High-Resolution ST Radar.

DESCRIPTIVE NOTE: Final technical rept. 30 Jun 86-29 Sep 88.

DESCRIPTIVE NOTE: Annual technical rept. 1 Jan-31 Dec 88.

SEP 88

FEB 89

CONTRACT NO. AFOSR-86 0241

PERSONAL AUTHORS: Fritts, David C.

PROJECT NO. 2917

CONTRACT NO. F49620-87-C-0024

TASK NO. A2

PROJECT NO. 2310

MONITOR: AFOSR

TASK NO. A1

TR-89-0283

MONITOR: AFOSR  
TR-89-0284

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) This grant involves the construction of MENTOR, an RF interferometer radar to study acoustic-gravity waves in the mesopause region of the earth's atmosphere, under the Department of Defense-University Research Instrumentation Program. The subcontractor for the construction of MENTOR has completed the radar and put it in the field. All the electronics are fielded in an 8'x8'x20' shipboard container, with the antenna arrays deployed close by. The electronics consists of a 50 kW transmitter, 8 receivers, and 150 Mips of on-line computer. The radar antenna consists of a 32-Yagi antenna array configured as 16 Yagis for transmit and 16 Yagis for receive. The transmit array is deployed on one side of the shipboard container and operated as a single in-phase beam; the 16 separate Yagis for receive are sampled as 8 rows of 4 Yagis each. (EDC)

DESCRIPTORS: (U) GRAVITY WAVES, RADIO INTERFEROMETERS, MESOPAUSE, RADAR ANTENNAS, WIND, ACOUSTIC WAVES, ANTENNA ARRAYS, COMPUTERS, CONTAINERS, DEPLOYMENT, EARTH ATMOSPHERE, ELECTRONICS, MEASUREMENT, MESOSPHERE, ON LINE SYSTEMS, RADAR TRANSMITTERS, RADAR RECEIVERS, RADIO FREQUENCY, SHIPBOARD, YAGI ANTENNAS.

IDENTIFIERS: (U) MENTOR radar, Radar interferometers, PE61102F, WUAFOSR2917A2.

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ABSTRACT: (U) Research during the past year included both theoretical and observational studies of gravity waves and their effects in the lower and middle atmosphere. Theoretical studies examined the stability conditions of inertio-gravity waves in order to address the most likely form of wave instability conditions of inertio-gravity waves in order to address the most likely form of wave instability and saturation as well as the atmospheric structures leading to ducting and wave energy transports. Ongoing theoretical studies are addressing nonlinear wave interactions and wave interactions and wave forcing via geostrophic adjustment. Observational work has dealt with mesospheric momentum fluxes at high latitudes and with continuing studies of wave and turbulence effects using a variety of data sets. Future work will address increasingly the sources and variability of such motions. (FR)

DESCRIPTORS: (U) ATMOSPHERES, GRAVITY WAVES, HIGH LATITUDES, INTERACTIONS, RADAR, ADDRESSING, DATA BASES, ENERGY TRANSFER, LOW ALTITUDE, MESOSPHERE, MOMENTUM, NONLINEAR SYSTEMS, STABILITY, THEORY, TURBULENCE, WAVES.

IDENTIFIERS: (U) PE61102F, WUAFOSR2310A1.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI32L

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AD-A205 588 22/5

ILLINOIS UNIV AT CHICAGO CIRCLE DEPT OF CIVIL ENGINEERING  
MECHANICS AND METALL URG)

ANALATOM INC SUNNYVALE CA

(U) Geometrical Foundations of Mesomechanics and  
Lagrangian Formalism.

(U) An Instrument for the Simultaneous Measurement of  
Velocity, Temperature and Density in Unseeded Air  
Flows.

DESCRIPTIVE NOTE: Final rept.

DESCRIPTIVE NOTE: Final rept. 1 Aug 88-31 Jan 89,

JAN 89

JAN 89

PERSONAL AUTHORS: Chudnovsky, A.; Kumin, B.

PERSONAL AUTHORS: Laufer, Gabriel

CONTRACT NO AFUSR-88-0034

REPORT NO. GL-88-2

PROJECT NO. 2302

CONTRACT NO. F49620-88-C-0126

TASK NO 82

PROJECT NO. 3005

MONITOR: AFOSR  
TR-89-0307

TASK NO. A1

MONITOR: AFOSR  
TR-89-0310

UNCLASS ) REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) Results of a scouting program of research  
in foundations of mesomechanics are presented. A special  
case of Weyl's geometry was employed to derive equations  
of thermoelasticity on pure geometrical ground; this  
demonstrates the potential of using Weyl's geometry as a  
model of the geometry of the material space. Experimental  
methods of finding fractal dimensions of fracture  
surfaces were examined (for various materials) together  
with a method of fracture profile simulation; the results  
contribute to developing experimental techniques of  
studying metric properties of the material space. A new  
dynamic crack propagation equation was derived on the  
basis of the least action principle; this is a first step  
of applying the Lagrangian formalism to deriving  
equations of continuous damage evolution. (KR)

DESCRIPTORS: (U) \*GEOMETRY, \*THERMOELASTICITY, DAMAGE,  
EQUATIONS, EVOLUTION(GENERAL), EXPERIMENTAL DESIGN,  
FRACTURE(MECHANICS), GROUND LEVEL, METHODOLOGY, PROFILES,  
PURITY, SIMULATION, SURFACES

IDENTIFIERS: (U) PEG1102F, WUAFOSR2302B2, \*Mesomechanics.

ABSTRACT: (U) The development and the design of advanced  
hypersonic vehicles such as the National Aerospace Plane  
(NASP) or the Space Shuttle will strongly depend on  
computer simulation mainly because some of the flight  
conditions experienced by these vehicles will be  
difficult or prohibitively expensive to create in ground  
facilities. Computer simulation will be used to reduce  
the need for expensive test time or will replace those  
experimental tests which can not be performed. However,  
computer simulations require validation before their  
results can be accepted. These validation tests, which  
must be performed in hypersonic and turbulent air flows,  
require the simultaneous measurement of air temperature,  
density and velocity at a high temporal and spatial  
resolution which will allow to resolve turbulence  
structures. (JES)

\* DESCRIPTORS: (U) \*AEROSPACEPLANES, \*HYPERSONIC VEHICLES,  
\*SPACE SHUTTLES, AIR FLOW, ATMOSPHERIC TEMPERATURE,  
COMPUTERIZED SIMULATION, EXPERIMENTAL DESIGN, FACILITIES,  
FLIGHT, GROUND LEVEL, HIGH RESOLUTION, HYPERSONIC FLOW,  
MEASUREMENT, RESOLUTION, SPATIAL DISTRIBUTION, STRUCTURES,  
SYNCHRONISM, TEST AND EVALUATION, TEST METHODS, TIME.

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TURBULENCE, TURBULENT FLOW, VALIDATION, VELOCITY.

VIRGINIA POLYTECHNIC INST AND STATE UNIV BLACKSBURG  
DEPT OF ENGINEERING SCIE NCE AND MECHANICS

IDENTIFIERS: (U) PEG5502F, WUAFUSR3005A1.

(U) Three-Dimensional Structure of Boundary Layers in  
Transition to Turbulence.

DESCRIPTIVE NOTE: Final rept. 1 Mar 87-30 Jun 88.

FEB 89

PERSONAL AUTHORS: Thornwald, Herbert

CONTRACT NO. F49620-87-K-0005

PROJECT NO. 2307

TASK NO. A2

MONITOR: AFOSR  
TR-89-0303

UNCLASSIFIED REPORT

ABSTRACT: (U) The Floquet theory of secondary instability in shear flows has been further developed and applied to a variety of flows. The linear theory has been extended to explain and quantitatively analyze the observed combination resonance in boundary layers. Numerical methods for the study of secondary instability in unbounded flows have been developed and applied to the viscous and inviscid mixing layer. The linear theory has been formulated for a variety of spatially periodic flows that include Gortler vortices and oblique waves. Applications await accounting for nonparallel effects. A new approach to analyzing nonparallel flows based on parabolic partial differential equations has been successfully applied to the primary stability problem. A perturbation method has been successfully applied to the primary stability problem. A perturbation method has been developed to reveal the nonlinear interactions that lead to breakdown of the laminar flow. This method permits prediction of the transition location in a given disturbance environment. Keywords: Boundary layer transitions; Instability; Gortler vortices. (jhd)

DESCRIPTORS: (U) \*BOUNDARY LAYER FLOW, \*BOUNDARY LAYER  
TRANSITION, \*VORTICES, INTERACTIONS, INVISCID FLOW,  
LAMINAR FLOW, LAYERS, LINEARITY, MIXING, NONLINEAR

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SYSTEMS, NUMERICAL METHODS AND PROCEDURES, PARABOLAS, PARTIAL DIFFERENTIAL EQUATIONS, PERTURBATIONS, RESONANCE, SHEAR PROPERTIES, STABILITY, THREE DIMENSIONAL FLOW, TURBULENCE, VISCOUS FLOW, WAVES.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2307A2, Floquet theory, Gortler vortices, Parabolic partial differential equations.

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ULTRASYSTEMS INC IRVINE CA CHEMICALS AND MATERIALS RESEARCH DEPT

(U) Heterocycles Based on Group III, IV, and V Elements Precursors for Novel Glasses and Ceramics.

DESCRIPTIVE NOTE: Annual progress rept. no. 3,

MAY 88

PERSONAL AUTHORS: Paciorek, K. L.; Nakahara, J. H.; Kratzer, R. H.

CONTRACT NO. F49620-85-C-0042

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-89-0281

UNCLASSIFIED REPORT

ABSTRACT: (U) The objective of this program is to explore the feasibility of synthesizing novel heterocyclics from the group of elements consisting of B, C, N, Al, Si, and P, the ultimate goal being the production of processible precursors leading to novel ceramics of unusual properties. The initial efforts under the program were devoted to development of processible preceramic systems leading to aluminum nitride ceramics. This involved the synthesis of novel trimethylsilylamino-substituted aluminum compounds and the study of their reactions. During the current reporting period the investigations of processible precursors of aluminum nitride were further pursued. Work was also directed at identification of processes leading to the formation of processible Al-N-E systems amenable to transformation into AlN-BN ceramics. Keywords: Ceramics; Synthesis chemistry. (kt)

DESCRIPTORS: (U) \*ALUMINUM COMPOUNDS, \*CERAMIC MATERIALS, \*HETEROCYCLIC COMPOUNDS, \*NITRIDES, PRECURSORS, PRODUCTION, SYNTHESIS, SYNTHESIS(CHEMISTRY), BORON, METHYL RADICALS, SILICON, AMINES.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2303B2.

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PENNSYLVANIA STATE UNIV UNIVERSITY PARK DEPT OF STATISTICS

(U) Multivariate Analysis and Its Applications.

DESCRIPTIVE NOTE: Annual rept. 1 Oct 87-31 Dec 88.

FEB 89

PERSONAL AUTHORS: Rao, C. R.

CONTRACT NO. AFOSR-88-0030

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR-89-0276

## UNCLASSIFIED REPORT

ABSTRACT: (U) During the period of October 1, 1987-December 31, 1988, research was carried out in several new areas of multi-variate analysis of interest to the Air Force. They have applications in manufacturing technology, automation, expert systems, pattern recognition and machine intelligence. About 59 Technical Reports were issued for publication in journals and presenting at conferences. A list of the Technical Reports together with the abstracts is given in the Appendix to this report. A brief outline of some of the important contributions is given. Keywords: Probability distributions, Discriminant analysis, Linear models, Bibliographies. (KR)

DESCRIPTORS: (U) \*MULTIVARIATE ANALYSIS, AIR FORCE, ARTIFICIAL INTELLIGENCE, BIBLIOGRAPHIES, DISCRIMINATE ANALYSIS, LINEARITY, MANUFACTURING, MATHEMATICAL MODELS, PATTERN RECOGNITION, PROBABILITY DISTRIBUTION FUNCTIONS.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2304A5.

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## DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI32L

AD-A205 572

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CINCINNATI UNIV OH DEPT OF CHEMISTRY

(U) X-Ray Absorption Spectroscopy of Electrochemically Generated Species.

DESCRIPTIVE NOTE: Annual rept. 1 Jan 88-31 Feb 89.

JAN 89

PERSONAL AUTHORS: Elder, Richard C.; Heineman, William R.

CONTRACT NO. AFOSR-88-0089

PROJECT NO. 2303

TASK NO. A1

MONITOR: AFOSR  
TR-89-0301

## UNCLASSIFIED REPORT

ABSTRACT: (U) Our research concerns the study of the change in the coordination environment and bond length about transition metals in complexes incorporated in a variety of media using EXAFS spectroelectrochemistry. These systems include: Fe(bipy)3(C104)2, Ru(bipy)3(C12), and Cu(dmp)2Bfs (bipy+2,2 bipyridine, dmp+2,90dimethyl-1,10-phenanthroline) in solution at reticulated vitreous carbon electrodes, and incorporated in Nafion films on gold Mylar and colloidal graphite gold Mylar electrodes; K3Fe(CN)6, Co(phen)3C13, Fe(bipy)3(C104)2, and K3Cu(bcp-s)2 (phen=1,10-phenanthroline, bcp-s=2,9 dimethyl-4,7-diphenyl-1,10-phenanthroline-disulfonic acid) incorporated in the solid polyelectrolytes poly(dimethylallyl ammonium chloride) and poly(acrylamide) on gold minigrid electrode in a humidistatic cell; and Prussian Blue, KFe(Fe(CN)6), cyanometallate films electrochemically deposited onto gold Mylar electrodes. (JES)

DESCRIPTORS: (U) \*BONDING, \*ELECTROCHEMISTRY, \*DEPOSITION, \*POLYETHYLENE TEREPHTHALATE, CARBON, POLYMERIC FILMS, RETICULAR FORMATION, TRANSITION METALS, VITREOUS STATE, X RAY ABSORPTION ANALYSIS, X RAY SPECTROSCOPY.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2303A1.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI32L

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AD-A205 570 7/4 20/5

STANFORD UNIV CA DEPT OF CHEMISTRY

YALE UNIV NEW HAVEN CONN

(U) Theory and Experimental and Chemical Instabilities.

(U) Spectrometric Studies of Gas Phase Collision Processes.

DESCRIPTIVE NOTE: Interim rept..

DESCRIPTIVE NOTE: Final rept. 1 Aug 87-31 Jul 88.

JAN 89

FEB 89

PERSONAL AUTHORS: Ross, John

PERSONAL AUTHORS: Fenn, J. B.

CONTRACT NO. AFOSR-87-0120

CONTRACT NO. AFOSR-87-0323

PROJECT NO. 2303

PROJECT NO. 2303

TASK NO. B1

TASK NO. B1

MONITOR: AFOSR  
TR-89-0306

MONITOR: AFOSR  
TR-89-0309

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) Progress is reported in research on theory and experiments in chemical instabilities including: Thermodynamics of Chemical Systems far from Equilibrium; Critical Slowing Down Phase Relations and Dissipation in Driven Oscillatory Systems; Universal Bifurcation Structures in Driven Oscillators; Deviations from Minimum Entropy Production at Steady States of Reacting Chemical Systems Arbitrarily Close to Equilibrium; Profiles and Front Widths of Chemical Waves in the Iron-Catalyzed Belousov-Zhabotinskii Reaction; Noise in Neural Networks; Thresholds, Hysteresis, and Neuromodulation of Signal-to-Noise; and Statistical-Mechanical Theory of Many-body Effects in Reaction Rates. (JES)

DESCRIPTORS: (U) \*CHEMISTRY, \*HYSTERESIS, \*N BODY PROBLEM, \*STABILITY, \*CHEMICALS, ENTROPY, EQUILIBRIUM(GENERAL), NEURAL NETS, OSCILLATION, OSCILLATORS, PRODUCTION, RATES, REACTION TIME, STEADY STATE, THEORY, THERMODYNAMICS, WAVES.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B1

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ABSTRACT: (U) Measurements have been made of the total radiation intensity from free jets of carbon dioxide and carbon that were excited in the source by a corona discharge. The radiation per molecule, obtained from the ratio of total intensity to source density, increases sharply when source temperature and pressure are such as the produce clustering in a jet of unexcited gas. We believe this enhancement may be due to interaction between aligned dipoles in adjacent cluster molecules. Measurements of the terminal rotational temperature of carbon monoxide and CO<sub>2</sub>, both pure in admixture with each other and/or argon indicate that CO always relaxes more slowly. There is no evidence of coupling between the rotational modes of the two species. Keywords: Gas dynamics, Infrared spectrometry, Rotational relaxation, Super-radiance, Collisions, Phase studies vapor phases. (aw)

DESCRIPTORS: (U) \*CARBON, \*CARBON DIOXIDE, \*CARBON MONOXIDE, \*COLLISIONS, \*ELECTRICAL CORONA, \*GAS DYNAMICS, \*RADIATION, \*VAPOR PHASES, ARGON, CLUSTERING, DENSITY, INFRARED SPECTROMETERS, INTENSITY, MOLECULES, PHASE STUDIES, RATIOS, RELAXATION, ROTATION, SOURCES, SPECTROMETRY, TEMPERATURE.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B1.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVIC2L

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CALIFORNIA INST OF TECH PASADENA DEPT OF CHEMISTRY

(U) Femtosecond Real Time Probing of Reactions. 2. The  
Dissociation Reaction of ICN.

NOV 88

PERSONAL AUTHORS: Dantus, Marcos; Rosker, Mark J.; Zewail,  
Ahmed H.

CONTRACT NO. AFOSR-87-0071

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-89-0160

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Chemical Physics, v89  
n10 p6128-6140, 15 Nov 88.

ABSTRACT: (U) Experimental results obtained for the  
dissociation reaction  $\text{ICN} \rightarrow \text{I} + \text{CN}$  yield I + CN  
using femtosecond transition-state spectroscopy (FTS) are  
presented. The process of the I-CN bond breaking is  
clocked, and the transition states of the reaction are  
observed in real time. From the clocking experiments, a  
'dissociation' time of 205 + or - 30 fs was measured and  
was related to the length scale of the potential. The  
transition states live for only approx. 50 fs or less,  
and from the observed transients we deduce some  
characteristics of the relevant potential energy surfaces  
(PES). These FTS experiments are discussed in relation to  
both classical and quantum mechanical models of the  
dynamical motion, including features of the femtosecond  
coherence and alignment of fragments during recoil. The  
observations are related to the radial and angular  
properties of the PES. Keywords: Cyanides, Iodine,  
Reprints. (MJM)

DESCRIPTORS: (U) 'CYANIDES, 'DISSOCIATION, 'IODINE,  
'QUANTUM THEORY, ALIGNMENT, ANGLES, DYNAMICS, FRAGMENTS,  
LENGTH, MODELS, MOTION, POTENTIAL ENERGY, REAL TIME,  
REPRINTS, RESPONSE, SCALE, SPECTROSCOPY, SURFACES,  
TRANSITIONS.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EV132L

AD-A205 566 CONTINUED

OKLAHOMA STATE UNIV STILLWATER DEPT OF CHEMISTRY

Keywords: Fluorine compound, Ethanes; Reprints. (MJM)

(U) Projection Methods for Obtaining Intramolecular Energy Transfer Rates from Classical Trajectory Results: Application to 1,2-Difluoroethane.

DESCRIPTORS: (U) \*ENERGY TRANSFER, \*ETHANES, \*TRAJECTORIES, \*FLUORINE COMPOUNDS, COMPUTATIONS, DECAY, ENERGY, FLUORINE, MOLECULAR PROPERTIES, RATES, REPRINTS, SURFACES, TIME, TIME DEPENDENCE, VALUE, VARIATIONS, VELOCITY, YIELD.

NOV 88

PERSONAL AUTHORS: Raff, Lionel M.

IDENTIFIERS: (U) PE61102F, WUAF0SR2303B3, \*Ethane/1,2-difluoro.

CONTRACT NO. AFOSR-86-0043

PROJECT NO. 2303

TASK NO. B3

MONITOR: AFOSR  
TR-89-0159

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Chemical Physics, v89 n9 p5680-5691, 1 Nov 88

ABSTRACT: (U) A general method for analyzing the results of classical trajectory calculation to obtain the details of intramolecular energy transfer is described. The method is based on the determination of the time dependence of the normal mode velocities by projection of the instantaneous Cartesian velocities onto the normal mode vectors. It is shown that the method obviates the need to arbitrarily define a 'bond' or 'mode' energy as a means of following the energy flow. Average mode energies are computed using the virial theorem. For a given potential surface, the results are exact within the framework of the classical approximation. The method is applied to a study of intramolecular energy transfer in 1,2-difluoroethane. Decay rates and pathways of energy flow for initial excitation of each of the 18 vibrational modes are reported. The results obtained from the time variation of the normal mode velocities are used to extract a first-order, mode-to-mode energy transfer rate coefficient matrix. The mode-to-mode coefficients are shown to provide an excellent means of collating the energy transfer information. Their values yield a quantitative description of the energy transfer rates and a clear picture of the relative importance of the available pathways for energy flow in the system.

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SRI INTERNATIONAL MENLO PARK CA

(U) Autoionization of H2 Induced by a Doubly Excited Triplet State

DESCRIPTIVE NOTE: Publication for Nov 86-Nov 88.

JUN 88

PERSONAL AUTHORS: Bjerre, N.; Keiding, S. R.; Lembo, L. J.; Helm, H.

CONTRACT NO. F49620-87-K-0002

PROJECT NO. 2303

TASK NO. 81

MONITOR: AFOSR  
TR-89-0161

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Physical Review Letters, v60 n24 p2465-2468, 13 Jun 88.

ABSTRACT: (U) The photoionization of molecular hydrogen has been extensively studied in recent years. For the singlet states, a variety of schemes for multiphoton excitation from the ground state has been developed. The spectroscopy of the triplet states usually starts from the metastable  $c^3\Pi_u$  state, which can be populated in electron impact excitation of a slow molecular beam or by resonant charge exchange in alkali vapor of a fast beam of  $H_2^+$ . The latter technique is used in the present work. All the bound triplet states observed so far are singly excited Rydberg states in the sense that their configuration is well described as an  $H_2^+$  core  $n'l$  plus an electronic ground state with a loosely bound outer electron. When photoionization proceeds via such a Rydberg state, it usually follows rather strict propensity rules in the vibrational quantum number. Vibrational autoionization of pure Rydberg states becomes less and less efficient with increasing  $n$ . Therefore it is quite remarkable that we in the present experiment observe strong one-photon ionization with a change of as much as ten vibrational quanta. Reprints (MUM)

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PENNSYLVANIA STATE UNIV UNIVERSITY PARK DEPT OF  
CHEMISTRY

(U) Polyporphazenes and their Relationship to Ceramics  
and Metals.

JAN 89

PERSONAL AUTHORS: Allcock, Harry R.

PROJECT NO. 2303

TASK NO. 82

MONITOR: AFOSR  
TR-89-0152

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Chapt. 53 in Ultra Structure  
Processing to Advanced Materials p705-713, 1988.

ABSTRACT: (U) One of the main principles that underlies  
the emerging research in solid-state science is that new  
materials, with new combinations of properties, may be  
accessible through synthetic chemistry in the interfacial  
region that lies between ceramics, metals, and polymers.  
Thus, polymers that contain main-group inorganic elements  
in the skeleton or side groups are prospective hybrids of  
polymers and ceramics. Polymers that contain transition  
metals may possess properties common to both  
macromolecules and bulk metals (e.g., electrical  
conductivity or catalytic activity). Also, main-group  
ceramics that contain metal atoms or ions may have  
magnetic or electrical properties that are reminiscent of  
metals. In our research program, we have concentrated on  
the interfacial area between polymers and ceramics as  
well as between polymers and metals. A review of  
developments in the author's laboratory on the way in  
which changes in the side groups attached to a  
polyporphazene chain move the properties in the  
direction of organic polymers, ceramics, or  
semiconductors. Keywords: Synthesis, Organosilicon,  
Phthalocyanine, (ICN0), Tetracyano Quinodimethane,  
Crosslinking chemistry. Reprints. (AW)

DESCRIPTORS: (U) \*CERAMIC MATERIALS, \*METALS,  
\*PHOSPHAZENE, \*POLYMERS, ATOMS, CATALYSTS, CHAINS.

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CROSSLINKING(CHEMISTRY), ELECTRICAL CONDUCTIVITY,  
ELECTRICAL PROPERTIES, HYBRID SYSTEMS, INTERFACES, IONS,  
LABORATORIES, MACROMOLECULES, MAGNETIC PROPERTIES,  
ORGANIC COMPOUNDS, PHTHALOCYANINES, REGIONS, REPRINTS,  
SEMICONDUCTORS, SIDES, SILICON COMPOUNDS, SOLID STATE  
ELECTRONICS, SYNTHESIS(CHEMISTRY), TRANSITION METALS.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2303B2.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EV132L

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SURFACES, VISIBILITY.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2303B1, \*Carbon  
trifluoroiodide.

AD-A205 537 7/2 7/4

SRI INTERNATIONAL MENLO PARK CA CHEMICAL KINETICS DEPT

(U) (3 + 2) Resonance Enhanced Multiphoton Ionization of I  
and Br Formed from the Infrared Multiphoton  
Decomposition of CF3I and CF3Br.

88

PERSONAL AUTHORS: Robertson, Robert M.; Golden, David M.;  
Rossi, Michel J.

CONTRACT NO. F49620-86-K-0001

PROJECT NO. 2303

TASK NO. 81

MONITOR: AFOSR  
TR-89-0295

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl of Chemical Physics, v89  
n5 p2925-2931, 1 Sep 88.

ABSTRACT (U) Resonance enhanced multiphoton ionization  
(REMPI) has been used to study the products of the  
infrared multiphoton decomposition (IRMPD) of CF3I in a  
very low-pressure photolysis (VLPphi) cell. The strongest  
REMPI signals are due to the ground state I(2P3/2) and  
the spin-orbit excited state I(2P1/2). The origins of I  
and I were determined from the time and IR laser fluence  
dependences of the EMPI signal. I is formed by visible  
single photon dissociation of vibrationally excited CF3I  
and by visible multiphoton dissociation of I2 and thermal  
CF3I. The ionization efficiency of I has been determined  
relative to NH3 for our probe laser conditions, and the  
sticking coefficient of I with gold surfaces has been  
determined. The REMPI spectra of the products of the  
IRMPD of CF3Br is also presented. Keywords: Carbon  
trifluoride, Bromine compounds, Iodine compounds,  
Reprints. (MJM)

DESCRIPTORS: (U) \*BROMINE COMPOUNDS, \*CARBON,  
\*DISSOCIATION, \*FLUORIDES, \*IODINE COMPOUNDS,  
\*PHOTOIONIZATION, COEFFICIENTS, DECOMPOSITION, EFFICIENCY,  
GOLD, INFRARED RADIATION, IONIZATION, LASERS, LOW  
PRESSURE, PHOTOLYSIS, PHOTONS, PROBES, REPRINTS, SPECTRA.

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SRI INTERNATIONAL MENLO PARK CA CHEMICAL KINETICS DEPT

(U) In situ Radical Detection under Very Low Pressure  
Photolysis Conditions Using Resonance-Enhanced  
Multiphoton Ionization. Kinetics of CF<sub>3</sub> Radicals  
Produced from IR Multiphoton Dissociation of  
Hexafluoroacetone.

\*FLUORINE COMPOUNDS, \*PHOTOIONIZATION, \*PHOTOLYSIS,  
CALIBRATION, DENSITY, DETECTION, DETERMINATION, FLOW RATE,  
FLUORIDES, INFRARED RADIATION, LASERS, LOW PRESSURE, MASS  
SPECTRA, MASS SPECTROMETRY, MOLECULES, PHOTONS, REACTION  
KINETICS, RECOMBINATION REACTIONS, REPRINTS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B1, \*Carbon  
trifluoride, \*Hexafluoroacetone.

88

PERSONAL AUTHORS: Robertson, Robert M.; Golden, David M ;  
Rossi, Michel J.

CONTRACT NO. F49620-86 K-0001

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-89-0296

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub in Jnl of Physical Chemistry,  
v92 n19 p5338-5347 1988.

ABSTRACT: (U) Resonance enhanced multiphoton ionization  
(REMPI) and mass spectrometry have been used to measure  
the kinetics of CF<sub>3</sub> radicals inside of a very low  
pressure photolysis (VLPphi) cell. Infrared multiphoton  
dissociation (IRMPD) of hexa-fluoroacetone (HFA) is used  
to generate the radicals according to CF<sub>3</sub>COCF<sub>3</sub> yields CF<sub>3</sub>  
+ CF<sub>3</sub>CO. REMPI spectra of vibrationally hot and  
thermalized CF<sub>3</sub> radicals are presented. The absolute  
density of CF<sub>3</sub> in the reactor is determined from the  
REMPI signal by using mass spectral data. This puts the  
calibration on the absolute basis necessary to treat  
competing unimolecular and bimolecular reactions of CF<sub>3</sub>  
free radical. Measuring the CF<sub>3</sub> density as a function of  
time between pulses of the IR laser and of HFA flow rate  
allows direct determination of the first and second-order  
loss rates for CF<sub>3</sub>. The CF<sub>3</sub>CO radical is stable under our  
conditions and engages in recombination back to HFA at  
higher radical densities. Keywords: Acetones, Fluorine  
compounds, Carbon trifluoride, Reprints. (MJM)

DESCRIPTORS: (U) \*ACETONES, \*CARBON, \*DISSOCIATION.

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AD-A205 534 CONTINUED

SRI INTERNATIONAL MENLO PARK CA CHEMICAL KINETICS DEPT

(U) Reaction Probability for the Spontaneous Etching of  
Silicon by CF<sub>3</sub> Free Radicals.

88

DESCRIPTORS: (U) \*ETCHING, \*SURFACE REACTIONS,  
\*PHOTOLYSIS, CARBON, PHOTODISSOCIATION, FLUORIDES, FREE  
RADICALS, GASES, INFRARED RADIATION, LAYERS, MASS  
SPECTROMETRY, MOLECULES, PHOTONS, PRECURSORS, PROBABILITY,  
RATES, REPRINTS, RESPONSE, SILICON, SURFACES, THERMAL  
PROPERTIES, REACTION KINETICS, ACETONES.

PERSONAL AUTHORS: Robertson, Robert M.; Golden, David M.;  
Rossi, Michel J.

IDENTIFIERS: (U) PEG1102F, WUAF0SR2303B1, Carbon  
trifluoride.

CONTRACT NO. F49620-86-K-0001

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-89-0299

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub in Jnl of Vacuum Science and  
Technology, B: Microelectronics Processing and Phenomena,  
v6 n6 p1632-1640 Nov/Dec 87.

ABSTRACT: (U) The spontaneous thermal etching of silicon  
by Carb on Trifluoride free radicals has been studied in  
a very-low-pressure photolysis reactor. The radical is  
produced by infrared multiphoton dissociation of either  
hexafluoroacetone or Carbon Trifluoride, and is allowed to  
react with a temperature-controlled silicon sample (560-  
745 K). Mass spectrometry is used to measure the extent  
of dissociation of the precursor gas and the formation of  
product molecules. Hexafluoroethane and Silicon  
tetrafluoride. The etch rate of the silicon is determined  
from the SiF<sub>4</sub> production. Resonance-enhanced multiphoton  
ionization of CF<sub>3</sub> is used to determine the density and  
time history of the radical in the reactor. The  
measurements of the etch rate and CF<sub>3</sub> density are  
combined to derive the reaction probability. CF<sub>3</sub> etches  
silicon much slowly than F atoms and at a rate comparable  
to molecular F<sub>2</sub>. A carbon layer, that is deposited on the  
silicon by the radicals, inhibits, but does not stop,  
further etching. Experiments on the etching of silicon by  
F<sub>2</sub> were performed both to validate the reactor design and  
to prepare the silicon surface for the CF<sub>3</sub> studies.  
Reprints. (aw)

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SRI INTERNATIONAL MENLO PARK CA CHEMICAL KINETICS DEPT

(U) Kinetics of Surface Reactions of CF<sub>3</sub> Radicals.  
IDENTIFIERS: (U) PE61102F, WUAFOSR2303B1, \*Carbon  
trifluoride, \*Copper oxides.

87

PERSONAL AUTHORS: Robertson, Robert M.; Rossi, Michel J.;  
Golden, David M.

CONTRACT NO. F49620-86-K-0001

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-89-0298

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Vacuum Science and  
Technology, A: Vacuum, Surfaces, and Films, v5 n6 p3351-  
3358 Nov/Dec 87.

ABSTRACT: (U) The kinetics of reactions of CF<sub>3</sub> radicals  
on various substrate materials has been studied in a gold  
coated, stainless steel, very low pressure photolysis  
(VLPph) cell as a function of temperature and radical  
concentration. The substrate materials were gold,  
stainless steel, copper, copper oxide, and silica. The  
CF<sub>3</sub> radicals were generated from CF<sub>3</sub>I by IR-multiphoton,  
decomposition. The reaction products observed with a mass  
spectrometer included HF, CO, CO<sub>2</sub>, COF<sub>2</sub>, SiF<sub>4</sub>, and C<sub>2</sub>F<sub>6</sub>.  
Rate constants were obtained as a function of temperature.  
CF<sub>3</sub> reacted most rapidly on copper oxide surfaces; the  
other metal surfaces were less reactive, and the silica  
surfaces were least reactive. Previous studies from this  
laboratory that had reported the reaction of CF<sub>3</sub> on  
fused silica are reinterpreted as reactions of CF<sub>3</sub> on  
the stainless-steel heater assembly. Keywords: Carbon  
trifluoride, Reprints. (MUM)

DESCRIPTORS: (U) \*CARBON, \*COATINGS, \*COPPER COMPOUNDS,  
\*FLUORIDES, \*GOLD, \*OXIDES, \*PHOTOLYSIS, \*SILICON DIOXIDE,  
\*STAINLESS STEEL, \*ASSEMBLY, \*CONSTANTS, \*COPPER, \*HEATERS,  
LOW PRESSURE, MASS SPECTROMETERS, MATERIALS, METALS,  
RATES, REACTANTS(CHEMISTRY), REPRINTS, SUBSTRATES,  
SURFACE REACTIONS, SURFACES.

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SRI INTERNATIONAL MENLO PARK CA CHEMICAL KINETICS DEPT

TEXAS UNIV AT AUSTIN DEPT OF CHEMISTRY

(U) Sticking Coefficient of the SiH<sub>2</sub> Free Radical on a Hydrogenated Silicon-Carbon Surface.

(U) Mechanism of the Claisen Rearrangement of Allyl Vinyl Ethers.

JAN 89

89

PERSONAL AUTHORS: Robertson, Robert M.; Rossi, Michel J.

PERSONAL AUTHORS: Dewar, Michael J.; Jie, Caoxian

CONTRACT NO. F49620-86-K-0001

CONTRACT NO. AFOSR-86-0022

PROJECT NO. 2303

PROJECT NO. 2303

TASK NO. B1

TASK NO. B2

MONITOR: AFOSR  
TR-89-0300MONITOR: AFOSR  
TR-89-0279

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Applied Physics Letters, v54  
n2 p185-187, 9 Jan 89.

SUPPLEMENTARY NOTE: Pub. in Jnl. of the American Chemical Society, v111 n2 p511-519 1989.

ABSTRACT: (U) The sticking coefficient of SiH<sub>2</sub> on a hydrogenated silicon carbon surface is measured in a low-pressure pulsed photolysis experiment. Thermal and vibrationally excited SiH<sub>2</sub> are created by infrared multiphoton decomposition of n-butylsilane. The first-order wall loss rates of the radicals are determined from the time dependence of the resonance-enhanced multiphoton ionization signal. The sticking coefficients of SiH<sub>2</sub> (approx. 0.1) and vibrationally hot SiH<sub>2</sub> (>0.5) are determined from the measured first-order loss rate constants and the calculated wall collision rate constant. Keywords: Silicon dihydride, Reprints. (MCM)

ABSTRACT: (U) AM1 calculations are reported for the Claisen rearrangements of allyl vinyl ether and 23 derivatives. The reactions are predicted, correctly, to take place preferentially via chair-type transition states and to lead preferentially to E isomers. While some of the reactions are predicted to take place by two alternative paths, corresponding to alternative synchronous and nonsynchronous mechanisms, involving transition states that are, respectively, aromatic and biradicaloid, the distinction here is only marginal, and most of the reactions took place by a single unique path of intermediate type. Keywords: Claisen rearrangement, Chemical radicals, Cyclic compounds, Molecular structure, Unsaturated carbonyl compounds, Pericyclic reactions, Reprints. (aw)

DESCRIPTORS: (U) \*PHOTOLYSIS, \*HYDRIDES, \*SILICON COMPOUNDS, \*CARBON, COEFFICIENTS, COLLISIONS, CONSTANTS, DECOMPOSITION, INFRARED RADIATION, LOSSES, LOW PRESSURE, PHOTONS, PULSES, RATES, REPRINTS, TIME DEPENDENCE, WALLS.

DESCRIPTORS: (U) \*ISOMERS, \*ETHERS, \*VINYL RADICALS, CHEMICAL RADICALS, CYCLIC COMPOUNDS, MOLECULAR STRUCTURE, PATHS, REPRINTS, TRANSITIONS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B1, \*Silicon dihydride.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B2, \*Allyl vinyl ethers, Claisen rearrangement.

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TEXAS UNIV AT AUSTIN DEPT OF CHEMISTRY

(U) Extension of AM1 to the Halogens,

88

PERSONAL AUTHORS: Dewar, Michael J.; Zebisch, Eve G.

CONTRACT NO. AFOSR-86-0022

PROJECT NO. 2303

TASK NO. 82

MONITOR: AFOSR  
TR-89-0277

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Molecular Structure  
(Theochem), v180 p1-21 1988.

ABSTRACT: (U) AM1 parameters are reported for the halogens (Fluorine, Chlorine, Bromine, Iodine). Results for a large number of halogen-containing organic molecules agree well with experiment, the agreement being generally better than for MNDO. The mean AM1 errors in heats of formation and other properties are now similar to those for compounds containing only the organic elements (C,H,O,N) and intermolecular interactions are now reproduced in a reasonable manner. While it is an improvement over MNDO, AM1 fails in the case of hypervalent compounds and it also underestimates the stabilities of pi complexes derived from halogen cations. Keywords: Computations. Heats of formation, Bond angles, Bond length, Ionization potentials, Dipole moments, Binding energies, Quantum, Chemistry, Tables data, Reprints. (aw)

DESCRIPTORS: (U) \*QUANTUM CHEMIST; HALOGENS, ANGLES, BONDING, BROMINE, CATIONS, CHLORINE, COMPUTATIONS, DIPOLE MOMENTS, FLUORINE, INTERACTIONS, IODINE, IONIZATION POTENTIALS, LENGTH, MOLECULE MOLECULE INTERACTIONS, NUCLEAR BINDING ENERGY, REPRINTS, STABILITY, TABLES(DATA).

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B2, AM1  
Computations.

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STATE UNIV OF NEW YORK AT BINGHAMTON DEPT OF CHEMISTRY

(U) Conductive and Optically Non-Linear Polymeric Langmuir-Blodgett Films of Poly(3-Dodecylthiophene).

88

PERSONAL AUTHORS: Logsdon, Peter B.; Pileger, Jiri;  
Prasad, Paras N.

CONTRACT NO. F49620-87-C-0042

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-89-0280

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Synthetic Metals, v26 p369-381 1988.

ABSTRACT: (U) Monolayer film formation at the air/water interface was investigated for both electrochemically and chemically prepared poly(3-dodecylthiophene) using surface pressure molecular area isotherms. Only the electrochemically prepared polymer formed a stable monolayer, which was successfully transferred using the horizontal lifting method. The transferred Langmuir-Blodgett films were characterized by u.v.-visible spectroscopy, quartz crystal microbalance measurements, electrical conductivity measurements and femtosecond degenerate four wave mixing studies of the third-order optical non-linearity. The third-order optical susceptibility of undoped poly(3-dodecylthiophene) was found to be  $\chi^{(3)}$  approx.  $10^{-10}$  to the 9th esu, large enough to allow the first reported observation of a degenerate four-wave mixing signal from ultrathin Langmuir-Blodgett films. In situ iodine-doping studies of u.v.-visible absorption, electrical conductivity and third-order nonlinear optical susceptibility were carried out. Upon doping, the conductivity increased by more than eight orders of magnitude and the  $\chi^{(3)}$  value decreased to within ten percent of the original value. Keywords: Thiophenes, Reprints. (MJM)

UNCLASSIFIED

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AD-A205 525 20/3

DESCRIPTORS: (U) \*ELECTRICAL CONDUCTIVITY, \*NONLINEAR SYSTEMS, \*OPTICAL PROPERTIES, \*THIOPHENES, \*POLYMERIC FILMS, AIR WATER INTERACTIONS, DOPING, ELECTRICAL MEASUREMENT, ELECTROMAGNETIC SUSCEPTIBILITY, FILMS, HORIZONTAL ORIENTATION, LAYERS, LIFT, REPRINTS, STABILITY.

STATE UNIV OF NEW YORK AT ALBANY

(U) High Electric Field Phenomena in Insulation.

DESCRIPTIVE NOTE: Final rept. 15 Nov 86-14 Nov 88.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303A3, \*Thiophene/poly3-dodecyl.

JAN 89

PERSONAL AUTHORS: Laghari, J. R.; Sarjeant, W. J.

CONTRACT NO. AFOSR-87-0063

PROJECT NO. 2301

TASK NO. A7

MONITOR: AFOSR  
TR-89-0266

UNCLASSIFIED REPORT

ABSTRACT: (U) The present study extends previous work to include electron radiation-induced changes in monoisopropyl biphenyl (MIPB)-impregnated polypropylene film as well as the effects of neutron/gamma radiation on dry polypropylene films. Effects that were quite similar were induced by both electron and neutron radiation on the properties of interest of the polypropylene films. Impregnation of the film with MIPB had a mitigatory effect on the degradation of the properties. This report also contains the results of a simultaneous electrical and thermal aging study of a capacitor-grade polypropylene film. The data obtained in this study was fitted to models that will enable realistic prediction of lifetimes under operating conditions. Keywords: Monoisopropyl biphenyl (MIPB) Polypropylene film. (jes)

DESCRIPTORS: (U) \*ELECTRIC FIELDS, \*ELECTRICAL PROPERTIES, \*ELECTRICAL INSULATION, AGING(MATERIALS), BIPHENYL, DEGRADATION, IMPREGNATION, LIFE SPAN(BIOLOGY), NEUTRONS, POLYPROPYLENE, PREDICTIONS, RADIATION, RADIATION EFFECTS, SYNCHRONISM, THERMAL PROPERTIES.

IDENTIFIERS: (U) PE61102F, WUAFOSR2301A7.

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BOSTON UNIV MA CENTER FOR ADAPTIVE SYSTEMS

(U) Stereo Boundary Fusion by Cortical Complex Cells: A System of Maps, Filters, and Feedback Networks for Multiplexing Distributed Data.

89

PERSONAL AUTHORS: Grossberg, Stephen; Marshall, Jonathan A.

CONTRACT NO. DAAG29-85-K-0095, F49620-87-C-0018

MONITOR: ARO, AFOSR  
22399.30-MA, TR-89-0337

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Neural Networks v2 p29-51 1989.

ABSTRACT: (U) A neural network model of multiple-scale binocular fusion and rivalry in visual cortex is described and simulated on the computer. The model consists of 3 parts: A distributed spatial representation of binocular input patterns among simple cells that are organized into ocular dominance columns; an adaptive filter from simple cells to complex cells; and a nonlinear on-center off-surround shunting feedback network that joins together the complex cells. This data structure generates complex cell receptive fields which multiplex input position, orientation, spatial frequency, positional disparity, and orientational disparity, and which are insensitive to direction-of-contrast in the image. Multiple copies of this circuit are replicated in the model using receptive fields of different sizes. Within each circuit, the simple cell and complex cell receptive field sizes covary. Together these circuits define a self-similar multiple-scales network. The self-similarity property across spatial scales enable the network to exhibit a size-disparity correlation, whereby simultaneous binocular fusion and rivalry can occur among the spatial scales corresponding to a given retinal region. It is shown that a laminar organization of the model interactions among the complex cells gives rise to conceptually simple growth rules for intercellular connections. Keywords: Binocular vision; Data fusion; Multiplexing; Binocular rivalry; Computational map;

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POLYTECHNIC UNIV FARMINGDALE NY DEPT OF AEROSPACE  
ENGINEERING

FLOW, VIBRATION.

(U) Optimum Aeroelastic Characteristics for Composite  
Supermaneuverable Aircraft.

IDENTIFIERS: (U) Supermaneuverable aircraft, Affine  
transformations, Aeroelastic tailoring, PE61102F,  
WUAFOSR2302B1.

DESCRIPTIVE NOTE: Final technical rept. 1 Jun 87-31 Sep  
88.

NOV 88

PERSONAL AUTHORS: Oyibo, Gabriel A.; Bentson, James;  
Weisshaar, T. A.

REPORT NO. POLY-AE-88-8

CONTRACT NO. F49620-87-C-0046

MONITOR: AFOSR  
TR-89-0127

UNCLASSIFIED REPORT

ABSTRACT: (U) The investigation of an aeroelastically induced constrained warping phenomenon for a composite, supermaneuverable type aircraft wing has continued in this second year of the study. The first year investigation was concentrated mainly on the static phenomena and the search for closed form solutions for free vibration of aircraft wings having constrained warping in the presence of elastic coupling. The wing is analytically modelled as a straight flat laminated plate. Various forms of highly simplified aerodynamic loads are employed in the analysis. The free vibrations and stability aspects of this phenomenon are examined to obtain some physical insights and to determine its importance and /or design implications. Analytical tools employed include an affine transformation concept which was formulated previously (by the present principal investigator) as well as a non-dimensionalization scheme. Keywords: Aeroelastic optimization, Aeroelasticity, Aeroelastic tailoring, Unsteady aerodynamics.

DESCRIPTORS: (U) 'AEROELASTICITY, 'COMPOSITE AIRCRAFT, 'WINGS, AERODYNAMIC CHARACTERISTICS, AERODYNAMIC LOADING, AERODYNAMIC STABILITY, COUPLING(INTERACTION), ELASTIC PROPERTIES, FLAT PLATE MODELS, LAMINATES, MATHEMATICAL ANALYSIS, OPTIMIZATION, SIMPLIFICATION, STATICS, UNSTEADY

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STANFORD UNIV CA THERMOSCIENCES DIV

Aircraft, Vortex generators. (jes)

(U) An Experimental Study of the Effect of Streamwise Vortices on Unsteady Turbulent Boundary-Layer Separation.

DESCRIPTORS: (U) \*AIRCRAFT, \*BOUNDARY LAYER, \*TURBULENT BOUNDARY LAYER, ADVERSE CONDITIONS, BEHAVIOR, CONTROL, CONVECTION, FLOW, FLOW FIELDS, FREE STREAM, MOMENTUM, MOMENTUM TRANSFER, PRESSURE GRADIENTS, QUICK REACTION, REACTION TIME, RESPONSE, REYNOLDS NUMBER, SEPARATION, STRESSES, THICKNESS, TURBULENT FLOW, UNSTEADY FLOW, VELOCITY, VORTEX GENERATORS, VORTICES.

DESCRIPTIVE NOTE: Technical rept..

DEC 88

PERSONAL AUTHORS: Humphreys, W. W.; Reynolds, W. C.

IDENTIFIERS: (U) PEG1103D, WUAFDSR3484A1.

REPORT NO. TF-42

CONTRACT NO. F4962-86-K-0020

PROJECT NO. 3484

TASK NO. A1

MONITOR: AFOSR  
TR-89-0275

UNCLASSIFIED REPORT

ABSTRACT: (U) This experiment studied the effect of streamwise vortices on unsteady turbulent boundary-layer separation. The objectives were to document the flow field, to characterize the time response of the boundary layer, and to understand the actual mechanisms by which the streamwise vortices modify boundary-layer behavior. A new configuration for non-obtrusive three-component Laser Doppler Anemometry (LDA) determined the phase averaged velocity and Reynolds stress components, in an unsteady water tunnel, at a momentum thickness Reynolds number of 1840. The streamwise vortices were created by three pairs of half-delta wing vortex generators, while the boundary-layer separation was controlled through impulsively initiated opposite-wall suction, which created a strong adverse pressure gradient. The time response of the freestream velocity demonstrates that convection is the primary mechanism by which vortex generators modify the response of the boundary layer. There is an initial fast response throughout the boundary layer which is unaffected by the presence of vortex generators, followed by a slow or convective response, the magnitude of which is substantially modified by the presence of the vortex generators. Flow control. Unsteady turbulent layers.

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YALE UNIV NEW HAVEN CONN

AD-A205 449 21/2 7/4

(U) Nonlinear Spectroscopy of Multicomponent Droplets and Two- and Three-Dimensional Measurements in Flames.

DESCRIPTIVE NOTE: Annual rept. 1 Jan-31 Dec 88.

JAN 89

PERSONAL AUTHORS: Chang, Richard K.; Long, Marshall B.

CONTRACT NO. AFOSR-88-0100

PROJECT NO. 2308

TASK NO. A3

MONITOR: AFOSR  
TR-89-0267

UNCLASSIFIED REPORT

ABSTRACT: (U) Our progress in the area of nonlinear spectroscopy of droplets includes the following: (1) demonstration that shape distortion of totally transparent liquid droplets can result via the electrostrictive force associated with the gradient of the laser intensity, which is greatest at the internal focal spot just within the droplet shadow face; (2) investigation of the quenching of the stimulated Raman scattering from droplets after the high intensity laser has reached the laser-induced breakdown threshold and produced a dense, high temperature plasma which can absorb the stimulated Raman radiation; (3) studies on the dependence of the intensity threshold to generate stimulated Raman scattering on the linewidth of the laser, which can be operated in a single mode or a multimode; and (4) development of a fluorescence imaging technique which is capable of demarcating the liquid phase of the deformed droplet after radiation by a carbon dioxide laser has caused the droplet to undergo vaporization. Stimulated Raman scattering. Stimulated Brillouin scattering. Laser induced breakdown. (mjim)

DESCRIPTORS: (U) CARBON DIOXIDE LASERS. DROPS. NONLINEAR SYSTEMS. SPECTROSCOPY. FLAMES. DEFORMATION. DENSE GASES. DISTORTION. ELECTROSTRICTION. FLUORESCENCE. HIGH RATE. HIGH TEMPERATURE. IMAGES. INTENSITY. INTERNAL.

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LASERS, LIGHT SCATTERING, LIQUID PHASES, LIQUIDS, MEASUREMENT, PHONONS, PLASMAS(PHYSICS), QUENCHING, RADIATION, RAMAN SPECTRA, SHAPE, STIMULATION(GENERAL), THREE DIMENSIONAL, THRESHOLD EFFECTS, TRANSPARENCY, VAPORIZATION.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2308A3.

## UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI32L

AD-A205 423 7/2 7/4

AD-A205 415 7/2 11/6.1

CALIFORNIA INST OF TECH PASADENA

OHIO STATE UNIV RESEARCH FOUNDATION COLUMBUS

(U) Molecular State Evolution after Excitation with an Ultra-Short Laser Pulse: A Quantum Analysis of NaI and NaBr Dissociation.

NOV 88

JAN 89

PERSONAL AUTHORS: Engel, Volker; Metiu, Horia; Almeida, Raphael; Marcus, R. A.; Zewail, Ahmed H.

PERSONAL AUTHORS: Faber, Katherine T.; Hirth, John P.; Ready, Dennis

CONTRACT NO. AFOSR-87-0071, NSF-CHE87-13619

CONTRACT NO. F49620-85-C-0129, \$ARPA Order-5526

PROJECT NO. 2303

PROJECT NO. 2917

TASK NO. 81

TASK NO. A3

MONITOR: AFOSR  
TR-89-0312

MONITOR: AFOSR  
TR-89-0265

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Chemical Physics Letters, v152 n1 p1-7, 4 Nov 88.

ABSTRACT: (U) In recent experiments Rose, Rosker and Zewail have used a femtosecond pulse to dissociate Sodium Iodide and Sodium Bromide, and a second pulse to probe the transition state by LIF. Here we show that quantum calculations, on a model system with no adjustable parameters, reproduce the principal observed features: Ultra short laser pulse; femtosecond, Transition state; Laser induced fluorescence; Atom; Molecule; Reprints. (mjm)

DESCRIPTORS: (U) \*BROMIDES, \*DISSOCIATION, \*IODIDES, \*LASER INDUCED FLUORESCENCE, \*QUANTUM STATISTICS, \*SODIUM, \*ATOMS, EVOLUTION(GENERAL), MODELS, MOLECULES, PARAMETERS, PROBES, PULSED LASERS, PULSES, REPRINTS, SHORT PULSES, TRANSITIONS.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2303B1, \*Sodium iodide, \*Sodium bromide.

ABSTRACT: (U) The role of isovalent dopants in the high temperature deformation of GaAs has been studied in the temperature range 550 C to 1150 C. Additions of In, Sb, and B increase the high temperature hardness and the critical resolved shear stress for deformation at a given strain rate and result in lowering the dislocation density of as-grown liquid-encapsulated Czochralski GaAs crystals. Phosphorus, because of its minor influence on the lattice strain, provides little enhancement of the yield stress. The results are consistent with a solute hardening model where the solute atom surrounded tetrahedrally by four Ga or As atoms comprise the hardening cluster. Codoping with In and Si is less effective than the isovalent solutes, In, B, and Sb, and produces softening at high temperatures. Transmission electron microscopy provides evidence consistent with the athermal contribution to the friction stress arising from a solid solution hardening effect. Curiosity studies on a solid solution in II-VI compounds, specifically, Cd<sub>1-x</sub>Mn<sub>x</sub>Te, demonstrate similar results. The role of dislocation damage in strained layer superlattices has also been modeled. Gallium arsenides, Antimony, Boron indium compounds, Gallium indium arsenides, Cadmium tellurides, Manganese compounds. (mjm)

DESCRIPTORS: (U) \*ANTIMONY, \*BORON COMPOUNDS, \*CADMIUM

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TELLURIDES, \*GALLIUM ARSENIDES, \*GROUP II-VI COMPOUNDS, \*INDIUM COMPOUNDS, \*MANGANESE COMPOUNDS, ARSENIDES, ATOMS, CLUSTERING, DAMAGE, DEFORMATION, DENSITY, DISLOCATIONS, ELECTRON MICROSCOPY, FRICTION, HARDENING, HARDNESS, HIGH TEMPERATURE, MODELS, OPTIMIZATION, PHOSPHORUS, SHEAR STRESSES, SOFTENING POINTS, SOLID SOLUTIONS, SOLUTES, SOLUTIONS(MIXTURES), STRAIN RATE, STRESSES, TEMPERATURE, TRANSMITTANCE, YIELD.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2917A3, OSURF-RF764977, OSURF-RF717636, \*Gallium indium arsenides.

AD-A205 414 20/5

STATE UNIV OF NEW YORK AT STONY BROOK DEPT OF CHEMISTRY

(U) Report of the Gordon Research Conference on Multiphoton Processes Held in New London, New Hampshire on 13-17 June 1988.

DESCRIPTIVE NOTE: Final rept. 1 Jun 86-31 May 87,

JUL 88

PERSONAL AUTHORS: Cruickshank, Alexander M.

CONTRACT NO. AFOSR-88-0201

PROJECT NO. 2301

TASK NO. A4

MONITOR: AFOSR  
TR-89-0255

UNCLASSIFIED REPORT

ABSTRACT: (U) The program of the Conference covered all aspects of Multiphoton Processes in atoms and molecules. There were sessions devoted to multiphoton ionization of atoms, multiphoton ionization in intense laser fields, multiphoton ionization of atoms, multiphoton in intense laser fields, multiphoton ionization and dissociation processes in small molecules, multiphoton dissociation processes in larger molecules (including picosecond processes), and general interest sessions. Symposia. (jhd)

DESCRIPTORS: (U) \*PHOTODISSOCIATION, \*PHOTOIONIZATION, ATOMIC PROPERTIES, INTENSITY, LASERS, MOLECULAR PROPERTIES, PHOTONS, SYMPOSIA

IDENTIFIERS: (U) PEG1102F, WUAFOSR2301A4, Multiphoton processes, Picosecond time.

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ARIZONA UNIV TUCSON

(U) Coordinated Noninvasive Studies (CNS) Project.

IDENTIFIERS: (U) PE61102F, WUAFOSR2313A6,  
CNS(Coordinated Noninvasive Studies).

DESCRIPTIVE NOTE: Final rept. 15 Sep 85-31 Oct 88.

NOV 88

PERSONAL AUTHORS: Lauter, Judith

CONTRACT NO. AFOSR-85-0379

PROJECT NO. 2313

TASK NO. A6

MONITOR: AFOSR  
TR-89-0264

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Original contains color plates; All  
DTIC and NTIS reproductions will be in black and white.

ABSTRACT: (U) Research activities during this period include: Data collection related to the interface between complex-sound production and perception, specifically, studies on speech acoustics including two experiments on voice-onset-time variability in productions by speakers of several languages, and a series on acoustical characteristics of emotional expression; data collection regarding individual differences in the effect of stimulus characteristic on relative ear advantages; continuing data analysis and new collections documenting individual differences in auditory evoked potentials, with details related to auditory-systems asymmetries; preliminary tests regarding the match between behavioral measures of relative ear advantages and quantitative electroencephalographic asymmetries observed during auditory stimulation; pilot testing using a combination of Nuclear Magnetic Resonance's (NMR) anatomical-imaging and chemical-spectral-analysis capabilities to study physiological activation in the human brain. (KR)

DESCRIPTORS: (U) \*ACOUSTICS, \*AUDITORY PERCEPTION, \*DATA ACQUISITION, \*SPEECH, ACTIVATION, BEHAVIOR, BRAIN, DATA PROCESSING, EAR, EMOTIONS, HEARING, HUMANS, PHYSIOLOGY, PILOT STUDIES, STIMULATION(PSYCHOLOGY).

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CONTINUED

CALIFORNIA INST OF TECH PASADENA

POLARIZATION, REPRINTS, ROTATION, THEORY.

(U) Circular Dichroism in Photoelectron Angular  
Distributions from Two-Color (1+1) REMPI (Resonantly  
Enhanced Multiphoton Ionization) of NO.

IDENTIFIERS: (U) WUAFOSR230383, PE61102F.

DESCRIPTIVE NOTE: Rept. 1 Nov 87-1 Nov 88.

DEC 87

PERSONAL AUTHORS: Appling, J. R.; White, M. G.; Dubs, R.  
L.; Dixit, S. N.; McKoy, V.

C.INTRACT AFOSR-87-0039

PROJ. N. 003

TASK 83

MONITOR: AFOSR  
TR-8J-0178

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. Chemical Physics, v87  
n12 p6927-6933, 14 Dec 87.

ABSTRACT: (U) A detailed experimental and theoretical study of dichroic effects in photoelectron angular distributions is reported for (1+1), two-color REMPI of NO via the A2sigma+, v=0 state. Optically aligned A state rotational levels are probed through ionization by circularly polarized light. Resultant photoelectron angular distributions exhibit significant left-right asymmetry, the phase and magnitude of which are shown to be related to the curvature of the excited state MJ distribution. Theoretical calculations involving a full ab initio treatment of the ionization dynamics result in circularly dichroic angular distribution (CDAD) parameters in good agreement with those derived experimentally. Additional effects including hyperfine depolarization and coherence are also discussed in relation to the observed CDAD data. Nitrogen oxide. Reprints (mjm)

DESCRIPTORS: (U) \*DICHROISM, \*NITROGEN OXIDES, \*PHOTOIONIZATION, ANGLES, CIRCULAR, COMPUTATIONS, DISTRIBUTION, DYNAMICS, IONIZATION, LIGHT, PHOTOELECTRONS.

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## DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVI32L

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7/3

NORTH DAKOTA STATE UNIV FARGO

(U) Relative Energies of Silaethylene and Methylsilylene.

DESCRIPTIVE NOTE: Rept. for 1 Nov 86-31 Oct 89.

88

PERSONAL AUTHORS: Grev, Roger S.; Scuseria, Gustavo E.;  
Scheiner, Andrew C.; Schaeffer, Henry F., III; Gordon,  
Mark S.

CONTRACT NO. AFOSR-87-0049

PROJECT NO. 2303

TASK NO. B3

MONITOR: AFOSR  
TR-89-0164

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of the American Chemical  
Society, v110 n22 p7337-7339 1988.

ABSTRACT: (U) The energy difference between silaethylene  
(H<sub>2</sub>Si=CH<sub>2</sub>) and methylsilylene (SiHMe) has been determined  
with ab initio quantum chemical techniques. Large basis  
sets and a variety of methods for the inclusion of  
electron correlation effects have been employed. In  
direct contrast to the recent theoretical and  
experimental results of Shin, Irikura, Beauchamp, and  
Goddard, which suggested silaethylene was 10 kcal/mol  
more stable than methylsilylene, we find the energy  
difference to be nearer 4 kcal/mol. Ethylenes, Silanes,  
Methyl radicals, Reprints. (mjm)

DESCRIPTORS: (U) \*ETHYLENES, \*METHYL RADICALS, \*QUANTUM  
CHEMISTRY, \*SILANES, CHEMICAL ENGINEERING, CONTRAST,  
CORRELATION, ELECTRONS, ENERGY, REPRINTS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B3, \*Silaethylene,  
\*Silylene/methyl.

AD-A205 368

## UNCLASSIFIED

AD-A205 361 4/1 20/13

COLORADO STATE UNIV FORT COLLINS DEPT OF ATMOSPHERIC  
SCIENCE

(U) On the Fundamental Solution of the Radiative Transfer  
Equation.

SEP 88

PERSONAL AUTHORS: Flatau, Piotr J.; Stephens, Graeme L.

CONTRACT NO. AFOSR-88-0143

PROJECT NO. 2310

TASK NO. A1

MONITOR: AFOSR  
TR-89-0244

## UNCLASSIFIED REPORT

Availability: Document partially illegible.

SUPPLEMENTARY NOTE: Pub. in Geophysical Research, v93 nD9  
p11,037-11,050, 20 Sep 88.

ABSTRACT: (U) This paper outlines the general solution  
of the one-dimensional, azimuthally averaged radiative  
transfer equation in terms of a matrix exponential. The  
link between this fundamental solution and those more  
commonly used in radiative transfer is established. The  
formulation is developed for a general vertically  
inhomogeneous atmosphere with sources. Several new  
concepts, based on properties of the matrix exponential,  
are described in the context of radiative transfer,  
including the use of the commutator and product integrals.  
It is also demonstrated how the matrix exponential  
formulation provides for new insights, not only into  
improvements of the numerical efficiency and stability of  
the solution, but also into the understanding of  
radiative transfer through a layered atmosphere. The  
various concepts introduced in this paper are illustrated  
throughout by the two-stream simplification of the  
general radiative transfer equation. Reprints. (jhd)

DESCRIPTORS: (U) \*RADIATIVE TRANSFER, ATMOSPHERES,  
EFFICIENCY, MATRICES(MATHEMATICS), LAYERS, NUMERICAL  
ANALYSIS, REPRINTS, SOLUTIONS(GENERAL), STABILITY.

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EXPONENTIAL FUNCTIONS, TRANSFER FUNCTIONS.

DELAWARE UNIV NEWARK DEPT OF MATHEMATICAL SCIENCES

IDENTIFIERS: (U) PE61102F, WUAFOSR2310A1.

(U) Two Methods for Solving the Inverse Acoustic Scattering Problem.

DESCRIPTIVE NOTE: Technical rept. Feb 88-Feb 89,

88

PERSONAL AUTHORS: Kirsch, A.; Kress, R.; Monk, P.; Zinn, A.

CONTRACT NO. AFOSR-86-0087

PROJECT NO. 2304

TASK NO. A9

MONITOR: AFOSR  
TR-89-0257

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Inverse Problems, v4 p749-770 1988.

ABSTRACT: (U) The inverse problem considered is to determine the shape of a sound -soft two-dimensional time-harmonic acoustic scatterer from the knowledge of the scattered far-field pattern. Two methods are described for approximately solving this improperly posed problem. They compare both the theory and the numerical performance of the methods. Reprints. (jhd)

DESCRIPTORS: (U) ACOUSTIC SCATTERING, INVERSE SCATTERING, FAR FIELD, HARMONICS, INVERSION, NUMERICAL ANALYSIS, PATTERNS, REPRINTS, SOUND, TIME, TWO DIMENSIONAL.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A9, Inverse problem.

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## DTIC REPORT BIBLIOGRAPHY

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AD-A205 358 7/3

COLUMBIA UNIV NEW YORK

CALIFORNIA UNIV SAN DIEGO LA JOLLA DEPT OF CHEMISTRY

- (U) Excited-State Resonance Raman Spectroscopy as a Probe of Alumina-Sodium Dodecyl Sulfate Hemimicelles.

- (U) Carbonylation Chemistry of the Tantalum Silyl (Eta5-C5Me5)C13TaSiMe3. Synthesis, Characterization, and Reaction Chemistry of (Eta5-C5Me5)C13Ta(Eta2-COSiMe3) and Derivatives.

DESCRIPTIVE NOTE: Interim rept. 1987-1988.

89

89

PERSONAL AUTHORS: Somasundaran, P.; Kunjappu, Joy T.; Kumar, Challa V.; Turro, Nicholas J.; Barton, Jacqueline K.

CONTRACT NO. AFOSR-88-0043

CONTRACT NO. AFOSR-85-0228

PROJECT NO. 2303

PROJECT NO. 2303

TASK NO. B2

TASK NO. B2

MONITOR: AFOSR  
TR-89-0260MONITOR: AFOSR  
TR-89-0259

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Langmuir, v5 n1 p215-218 1989.

SUPPLEMENTARY NOTE: Pub. in Jnl. of the American Chemical Society, v111 n1 p149-164 1989.

ABSTRACT: (U) Excited state resonance Raman spectroscopy has been shown to be a sensitive technique to monitor the formation of hemimicelles. The alumina sodium dodecyl sulfate hemimicelles are examined by excited state Raman spectroscopy, for the first time, by observing the Raman spectrum of tris (2,2'-bipyridyl) ruthenium (II) incorporated in the solid liquid interface under in situ equilibrium conditions. The study clearly shows several transitions are sensitive to the evolution and structure of hemimicelles. Ionic surfactants; Raman spectroscopy; hemimicelles; alumina sodium dodecyl sulfate; Reprints. (mj)

ABSTRACT: (U) The potent reactivity of early transition metal, lanthanide, and actinide alkyl derivatives toward carbon monoxide has led to numerous theoretical and experimental investigations. The eta-acyl complexes that result from this reactivity have also generated wide interest, particularly with regard to their electrophilicity, which has been ascribed to carbene or carbenium ion character at the acyl carbon atom. This characteristic is expressed in a variety of ways, as in the migration of an alkyl or hydride ligand to the eta-acyl, with ketone or aldehyde formation. This paper describes the carbonylation chemistry of the electron deficient (formally 14-electron) tantalum silyl Cp C13 TaSiMe3. These investigations have provided an eta-silaacyl complex, Cp C13 Ta(eta2-COSiMe3), that is quite reactive toward a variety of nucleophilic reagents and cleanly gives a number of stable addition products. Reprints. (mj)

DESCRIPTORS: (U) ALUMINUM OXIDES, DODECANE, RAMAN SPECTROSCOPY, SODIUM SULFATES, ENERGY LEVELS, EQUILIBRIUM(GENERAL), EVOLUTION(GENERAL), EXCITATION, INTERFACES, LIQUIDS, METHODOLOGY, MONITORING, RAMAN SPECTRA, REPRINTS, RESONANCE, RUTHENIUM, SENSITIVITY, SOLIDS.

DESCRIPTORS: (U) CHEMICAL REACTIONS, TANTALUM COMPOUNDS, SILANES, ADDITION, ALDEHYDES, CARBON MONOXIDE, ELECTRONS, HYDRIDES, IONS, KETONES, LIGANDS, POTENCY, REACTIVITIES, REPRINTS, STABILITY, SYNTHESIS(CHEMISTRY), THEORY, TRANSITION METALS.

IDENTIFIERS: (U) PE61102F, WUAFOSR230382, Sulfate/alumina-sodium dodecyl.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI32L

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IDENTIFIERS: (U) PE61102F, WUAFOSR230382, \*Tantalum/silyl.

CALIFORNIA INST OF TECH PASADENA

(U) Laser Femtochemistry.

DEC 88

PERSONAL AUTHORS: Zewail, Ahmed H.

CONTRACT NO. AFOSR-87-007

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-89-0270

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Science, v242 p1645-1653, 23 Dec 88.

ABSTRACT: (U) Femtochemistry is concerned with the very act of the molecular motion that brings about chemistry, chemical bond breaking, or bond formation on the femtosecond 10 to the -15th time scale. With lasers it is now possible to record snapshots of chemical reactions with sub-angstrom resolution. This strobing of the transition-state region between reagents and products provides real time observations that are fundamental to understanding the dynamics of the chemical bond. Keywords: Femtochemistry; Lasers; Chemical reactions; Chemical bond; Molecular beam; Transition state; Reprints. (MJM)

DESCRIPTORS: (U) \*BONDING, \*CHEMICAL BONDS, \*CHEMICAL REACTIONS, \*DYNAMICS, \*LASERS, CHEMISTRY, MOLECULAR BEAMS, MOLECULES, MOTION, REAL TIME, REPRINTS, TRANSITIONS.

IDENTIFIERS: (U) WUAFOSR230381, PE61102F, \*Femtochemistry.

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AD-A205 296 CONTINUED

CARNEGIE MELLON UNIV PITTSBURGH PA DEPT OF METALLURGICAL  
ENGINEERING AND MATERIALS SCIENCE

(U) Fundamental Studies of Beta Phase Decomposition Modes  
in Titanium Alloys.

DESCRIPTORS: (U) \*TITANIUM ALLOYS, ALUMINUM ALLOYS,  
BOUNDARIES, COMPENSATORS, CRYSTAL SUBSTRUCTURE, CRYSTALS,  
DECOMPOSITION, DISLOCATIONS, FOILS(MATERIALS), GRAIN  
BOUNDARIES, INTERFACES, PHASE STUDIES, PLATES, STRUCTURES,  
THINNESS.

DESCRIPTIVE NOTE: Interim technical rept. 1 Oct 87-30 Sep  
88.

IDENTIFIERS: (U) PE61102F, WUAFOSR2306A1.

JAN 89

PERSONAL AUTHORS: Aaronson, H. I.; Furuhashi, T.; Mou, Y.

CONTRACT NO. AFOSR-84-0303

PROJECT NO. 2306

TASK NO. A1

MONITOR: AFOSR  
TR-89-0235

UNCLASSIFIED REPORT

ABSTRACT: (U) A TEM investigation of the interphase  
boundary structure of (hcp) grain boundary alpha  
alloyed in a titanium-7.15 W/O chromium alloy has  
shown that whether these crystals are Burgers or non-  
Burgers-related with respect to their bounding (bcc) beta  
matrix grains their interfacial structures are partially  
coherent. No misfit dislocations are observed at either  
type of interface. Instead, two types of ledge are  
present. One type is widely and irregularly spaced and  
heavily kinked; this appears to be growth ledges. The  
other type are quite straight and both closely and  
uniformly spaced; this is likely to be structural ledges.  
Habit plane measurements on the broad faces of alpha  
plates support the presence of structural ledges. These  
ledges have a Burgers vector of  $a/6$  (111) parallel to the  
terrace plane, indicating that they can perform as  
significant compensators of misfit dislocations. Studies  
on the interphase boundary structure of the BCC/HCP  
massive transformation in a silver-26 Al/O aluminum alloy  
have reached the point where a technique for preparing  
thin foils in a manner which permits a significant number  
of interfaces to be imaged has finally been achieved.  
Studies of this structure have now been initiated. (AW)

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ILLINOIS UNIV AT URBANA DEPT OF CHEMISTRY

SILICON DIOXIDE, SPECTROSCOPY, SPINNING(MOTION),  
MOLECULAR STRUCTURE, SYMMETRY, WATER.

(U) Solid State  $^{29}\text{Si}$  and  $^{11}\text{B}$  NMR (Nuclear Magnetic  
Resonance) Studies of Sol-Gel Derived Borosilicates.

IDENTIFIERS: (U) PES1102F, WUAFOSR2303A3, Borosiloxanes.

88

PERSONAL AUTHORS: Irwin, A. D.; Holmgren, J. S.; Jonas, J.

CONTRACT NO. AFOSR-85-0345

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-89-0248

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Non-Crystalline  
Solids, v101 p249-254 1988.

ABSTRACT: (U) Gels in the system Silicondioxide-Boric  
Oxide were prepared from metal alkoxides. The structural  
evolution of these gels as a function of thermal  
treatment was studied by high field  $^{29}\text{Si}$  and  $^{11}\text{B}$  NMR  
spectroscopy, using magic angle spinning. The results  
corroborate earlier work on this system using infrared  
spectroscopy to follow the formation of borosiloxane  
bonds during heat treatment. While incorporation of boron  
into the silica backbone is negligible in gels dried at  
room temperature only, thermal treatment drives the  
borosiloxane bond formation with removal of excess water.  
Initial boron environments. Further heating causes the  
condensation of boron into symmetric trigonal  $=\text{B}-\text{O}-\text{Si}$   
triple bond sites. Boron is fully incorporated by 450C.  
In addition to the symmetric trigonal boron environment  
of borosiloxane bonds, a small signal is also observed  
from  $^{11}\text{B}$  nuclei in asymmetric trigonal environments in  
the gels heated to  $>$  or  $\approx$  450 C, presumably infrared  
spectroscopy. Reprints. (AW)

DESCRIPTORS: (U) 'GELS, 'BORON COMPOUNDS, 'SILICATES,  
ALKOXY RADICALS, ANGLES, ASYMMETRY, CHEMICAL BONDS, BORON,  
CONDENSATION, ENVIRONMENTS, EVOLUTION(GENERAL), HEAT  
TREATMENT, INFRARED SPECTROSCOPY, METAL COMPOUNDS,  
NUCLEAR MAGNETIC RESONANCE, NUCLEI, REPRINTS, SIGNALS.

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ILLINOIS UNIV AT URBANA DEPT OF CHEMISTRY

ILLINOIS UNIV AT URBANA DEPT OF CHEMISTRY

(U) Self-Diffusion in the Compressed, Highly Viscous  
Liquid 2-Ethylhexyl Benzoate,

(U) Thermotropic Ionic Liquid Crystals. 7. Calculation of  
Sodium-23 Quadrupole Coupling Constants in Lamellar  
Phases of Sodium Alkanolates,

88

APR 87

PERSONAL AUTHORS: Walker, N. A.; Lamb, D. M.; Adamy, S. T.  
; Dare-Edwards, M. P.

PERSONAL AUTHORS: Phillips, M. L.; Jonas, J.

CONTRACT NO. AFOSR-85-0345

CONTRACT NO. AFOSR-85-0345

PROJECT NO. 2303

PROJECT NO. 2303

TASK NO. A3

TASK NO. A3

MONITOR: AFOSR  
TR-89-0247

MONITOR: AFOSR  
TR-89-0249

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Physical Chemistry,  
v92 n12 p3675-3679 1988.

SUPPLEMENTARY NOTE: Pub. in Jnl. of Chemical Physics, v86  
n7 p4294-4295, 1 Apr 87.

ABSTRACT: (U) The self diffusion coefficients, densities  
and viscosities of liquid 2 ethylhexyl benzoate are  
reported as a function of pressure from 1 to 4500 bar  
within the temperature equation are used to analyze the  
data. The RHS model indicates a high degree of rotational  
translational coupling which increases as density  
increases. The non spherical shape and conformational  
flexibility of the molecule is proposed as the cause of  
this behavior. The Stokes Einstein equation is found to  
hold over five orders of magnitude changes in self  
diffusion and viscosity. Diffusion; High pressure;  
Hydrodynamic behavior; Benzoates; Ethyl radicals; Hexyl  
radicals; Reprints. (mjm)

ABSTRACT: (U) The <sup>23</sup>Na quadrupole coupling constants  
(QCC) were calculated for a quasi-crystalline model of  
the neat phase of anhydrous amphiphiles. The magnitude of  
the QCC in short chain sodium alkanolates and its  
dependence on the lateral packaging area of the polar  
heads was accurately predicted by assuming the charges to  
lie in a double-layered square array of interdigitated  
ion pairs. Quadrupole coupling constant; Thermotropic  
ionic liquid crystals; Reprints. (mjm)

DESCRIPTORS: (U) \*QUADRUPOLE MOMENT, \*ALKANES, \*SODIUM  
COMPOUNDS, COUPLING(INTERACTION), IONS, PHASE, REPRINTS.

DESCRIPTORS: (U) \*BENZOATES, \*ETHYL RADICALS, \*HEXYL  
RADICALS, \*HYDRODYNAMICS, \*VISCOSITY, DENSITY, DIFFUSION,  
DIFFUSION COEFFICIENT, EQUATIONS, HIGH PRESSURE, REPRINTS,  
SELF OPERATION, TEMPERATURE.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303A3, \*Benzoate/2-  
ethylhexyl.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303A3.

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ILLINOIS UNIV AT URBANA DEPT OF CHEMISTRY

(U) Fluids, Gels and Glasses Under Extreme Conditions of Pressure and Temperature.

HYDRODYNAMICS, HYDROLYSIS, LIQUIDS, LUBRICANTS, MODELS, MOLECULAR PROPERTIES, MOLECULAR STATES, POLAR REGIONS, PRESSURE, RAMAN SPECTRA, SHEAR PROPERTIES, VISCOSITY.

DESCRIPTIVE NOTE: Final rept. 1 Oct 85-31 Oct 88.

IDENTIFIERS: (U) PE61102F, WUAF0SR2303A3.

FEB 89

PERSONAL AUTHORS: Jonas, Jiri

CONTRACT NO. AFOSR-85-0345

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-89-0263

UNCLASSIFIED REPORT

ABSTRACT: (U) The NMR and Raman techniques were used to investigate the hydrolysis and condensation mechanism in B2O3-SiO2; Al2O3-SiO2; and Na2O-Al2O3-SiO2 systems. The solid state NMR techniques were employed together with BET methods to follow the thermal treatment of the gels. In addition to the NMR and Raman techniques, the SANS method was employed to study the effects of fluoride anion catalyst on the sol-gel process involving TiO2. High pressure NMR studies of the dynamic structure of the highly viscous liquids focused on three projects: i) The self-diffusion behavior, and the applicability of hydrodynamic equations at the molecular level for a model lubricant - 2-ethylhexylbenzoate; ii) The effect of the dipole moment on the hydrodynamic behavior of highly polar fluids; iii) The effect of molecular flexibility on the relationship between molecular properties and shear viscosity at extreme conditions of pressure. Boron oxides, Silicon dioxide, Sol gel process, Viscous liquids, Raman, High pressure, Structure property relationship, Aluminum oxide, Sodium oxide. (mjml)

DESCRIPTORS: (U) \*ALUMINUM OXIDES, \*BORON OXIDES, \*FLUIDS, \*GELS, \*OXIDES, \*SILICON DIOXIDE, \*SODIUM, \*GLASS, ANIONS, BEHAVIOR, CATALYSTS, CONDENSATION, DIFFUSION COEFFICIENT, DIPOLE MOMENTS, DYNAMICS, EQUATIONS, FLUORIDES, HEAT TREATMENT, HIGH PRESSURE,

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